MACHINERY

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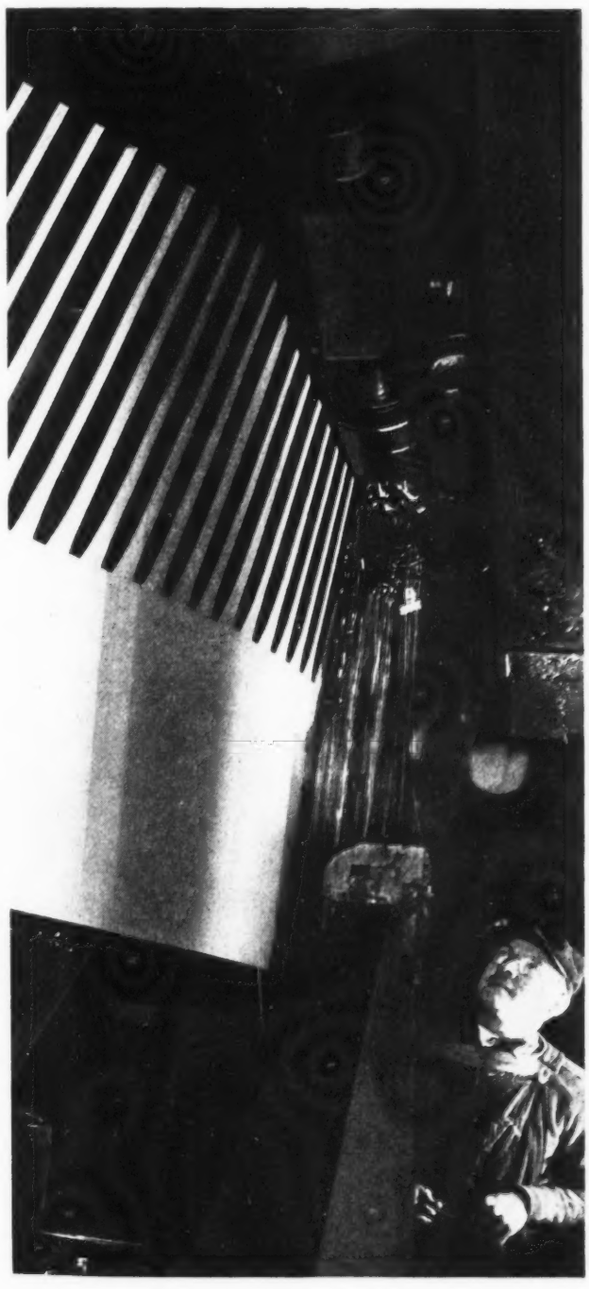
Making Gears for Transmitting 8000 Horsepower



Operations Performed in Producing the Huge Gears and Heavy-Duty Pinions Used in Driving the Rolling Mills of the Steel Industry

By CHARLES O. HERB

GEARS used in the drives of steel rolling mills must often meet tremendous power requirements. The Lewis Foundry & Machine Co., a subsidiary of the Blaw-Knox Co., Pittsburgh, Pa., has built many such gear drives, some of them for transmitting as much as 8000 horsepower. Gears up to 15 feet pitch diameter and 48 inches face width, with teeth as large as 1 diametral pitch, are regularly made. These gears weigh up to 30,000 pounds each and must be in balance within approximately 1 inch-pound. They must also be accurate as to tooth form and pitch diameter in order to operate quietly with minimum power loss, electricity costs, and gear tooth wear. Pitch diameters are held to within 0.002 inch on the largest gears, and the tooth form must be true within correspondingly close limits.

The gears are ordinarily cast from alloy steel, while the pinions and their integral shafts or journals are forged. The operations performed in making these heavy-duty gears and pinions at the Lewis plant will be described in this article.

The heavy gear castings are turned, bored, and faced on the 10-foot Cincinnati Hypro boring mill shown in Fig. 1. After the casting has been carefully lined up on the table of this machine, a rough-turning cut is taken across the gear face, the central hole is rough-bored, and the top and bottom bosses and rims are faced, the gear casting, of course, being turned over in this operation for machining both sides. Then the casting is again unclamped in order to permit the stresses developed in the rough-machining to be released, after

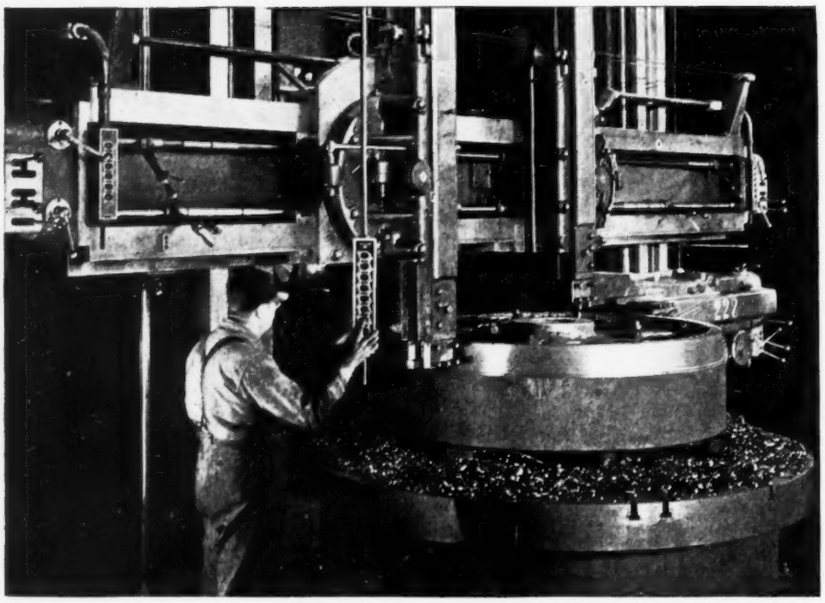


Fig. 1. Gear Blanks up to 15 Feet in Diameter are Rough and Finish Turned, Faced and Bored on the Vertical Boring Mill Shown

which the casting is carefully reset and clamped for taking the finishing cuts. Limits of plus or minus 0.001 inch must be held in taking the finish cut in the bore, and limits of plus or minus 0.002 inch on the outside diameter of gears, say, 15 feet in diameter.

The pinion forgings are rough-turned and faced all over and also annealed to a predetermined hardness in the forge shop. When they reach the Lewis plant, they are finish-turned and faced all over in heavy-duty lathes set up as illustrated in Fig. 2. Provision must be made to support the pinion forgings adequately in this operation, because they range up to 38 inches in diameter, 10 feet in length, and approximately 20,000 pounds in weight.

After the turning and facing, the pinion blanks are ground to specified diameters within limits of 0.0005 inch in roll-grinding machines.

The gears are hobbed on Gould & Eberhardt and Westinghouse machines set up as shown in Fig. 3. On wide-face gears the teeth are of the staggered herringbone type, the inner end of each tooth being in line with a space between two opposing teeth. The advantages claimed for teeth of this type are unusually good distribution of the load and easy flow of the lubricant from tooth to tooth. With the staggered teeth, there is a continuous zig-zag channel through which the oil can readily flow when the gears and pinions are running in mesh. Single helical teeth are hobbed on gears of narrow face.

Gears up to 15 feet in diameter are handled on the machine shown in Fig. 3, although the gear seen on the table is only about 8 feet in diameter.

In setting up a gear for the tooth-hobbing operation, the accuracy of the set-up is determined by revolving the gear at a fast speed in contact with

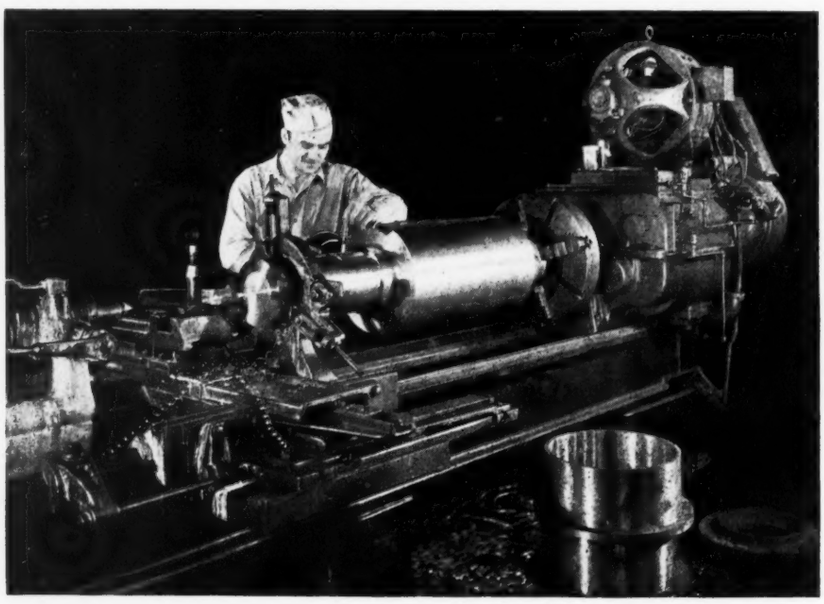


Fig. 2. Pinion Blanks Weighing up to 20,000 Pounds are Finish Turned and Faced in Heavy-duty Lathes, as Here Illustrated

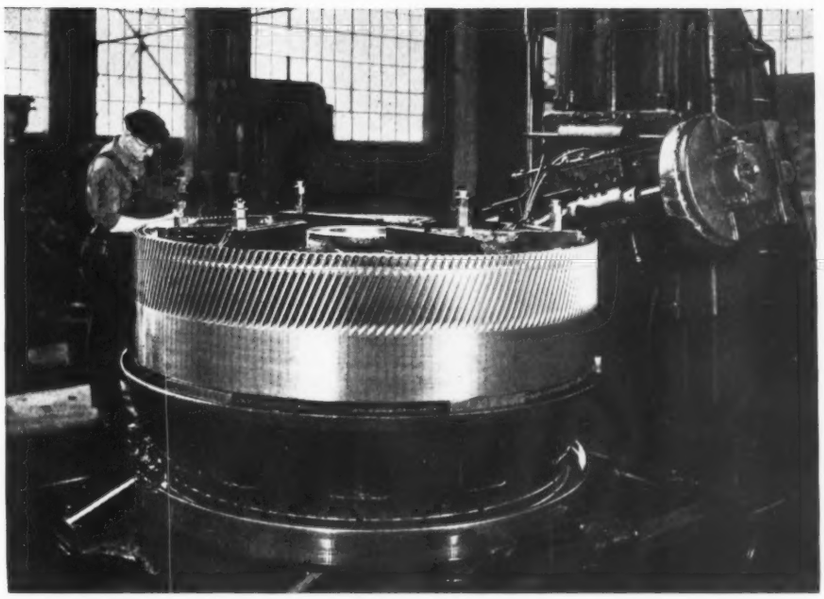


Fig. 3. The Staggered Herringbone Teeth are Hobbed on Machines that Have a Capacity for Gears up to 15 Feet in Diameter

a dial indicator attached to the hob slide. Similar readings are also taken on the finished bore as a double check. Adjustments are made until the gear face and bore run true. The teeth are next roughed out on one side of the face, as seen in the heading illustration; the gear is then turned over on the machine table and again carefully checked for true running, after which the teeth are roughed out on the second half of the face.

The gear rotation is then checked again to see whether the stresses produced in the boring operation are causing the gear to revolve eccentrically, the run-out being held to not more than 0.008 inch. After the necessary adjustments of the work have been made and the hob changed, finishing cuts are taken on the gear teeth, the same procedure being followed as in roughing. When a finishing cut has once been started on a gear, the machine is not shut down until the operation has been completed, even though many hours are involved, because it is practically impossible to avoid producing a slight step on the gear teeth when a machine is started again after having been stopped in the midst of an operation.

A hook-tooth, short-lead hob is used in roughing, and a standard hob of ground-tooth form in finishing. On coarse-pitch teeth of, say, 1 1/2 or 1 diametral pitch, a single-thread hob is employed, and on teeth down to 3 diametral pitch, a multiple-thread hob is used. Standard cutting oil is applied copiously to the hob and work during these operations. Several hundred hours are required for hobbing a 15-foot gear of, say, 48-inch face width. The operation cannot be speeded up too fast because of the excessive stresses that would be created.

In hobbing the pinion teeth, the pinion blank is

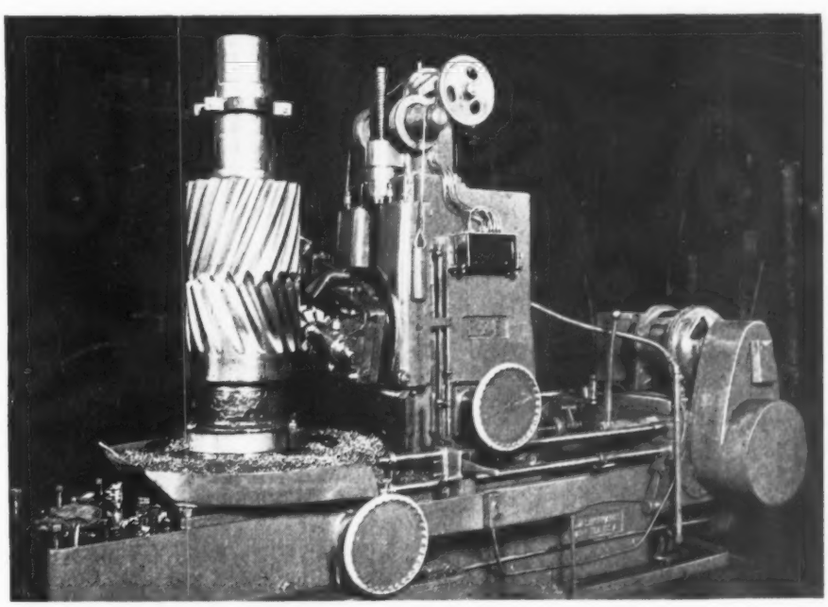


Fig. 4. Rough-hobbing the Staggered Teeth on the Second Side of the Pinion after Teeth have been Rough-hobbed on the Other Side

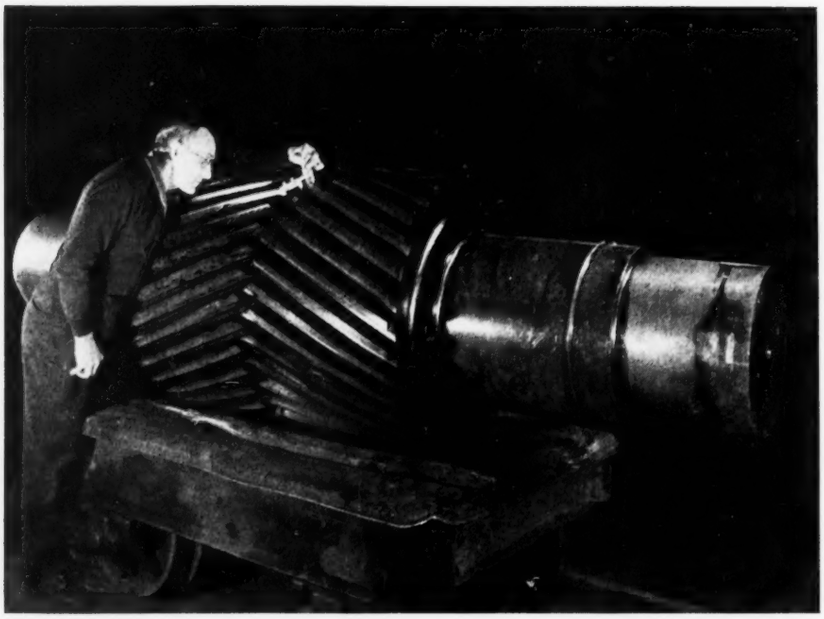


Fig. 5. Upon the Completion of Finish-hobbing, the Teeth of Pinions and Gears are Carefully Inspected for Tooth Form and Dimensions

mounted vertically on the machine table, as shown in Fig. 4, with the journal at the lower end rigidly supported in a split chuck. As in hobbing the gears, the pinion teeth are first roughed out on one half of the face, and then, after the pinion has been changed end for end in the chuck, the teeth on the opposite side are roughed out. The pinion is also checked for true running of the journals at the beginning of the operation, and at the end of the roughing, adjustments are made for any eccentricity caused by stresses created during the roughing cuts.

The teeth are then finish-hobbed. Both the finished gear and pinion teeth are checked for width at the pitch line and for variations between the teeth by a B. & S. vernier gear tooth caliper.

The journals of some pinions are finish-ground after the hobbing operation in the same huge roll grinders employed in grinding the surfaces of the pinion blanks before cutting the teeth. One of these operations is illustrated in Fig. 7.

Both gears and pinions are next checked for static balance. In checking the pinions, their journals or the Timken roller bearings, if they have been assembled to the journals, are supported on rests that consist of two roller bearings about 4 inches outside diameter. Static balance can readily be determined by merely turning the pinions on these roller-bearing supports.

The gears are first assembled on their shafts and then placed on the balancing stand with the shaft ends supported by the roller-bearing rests. Careful

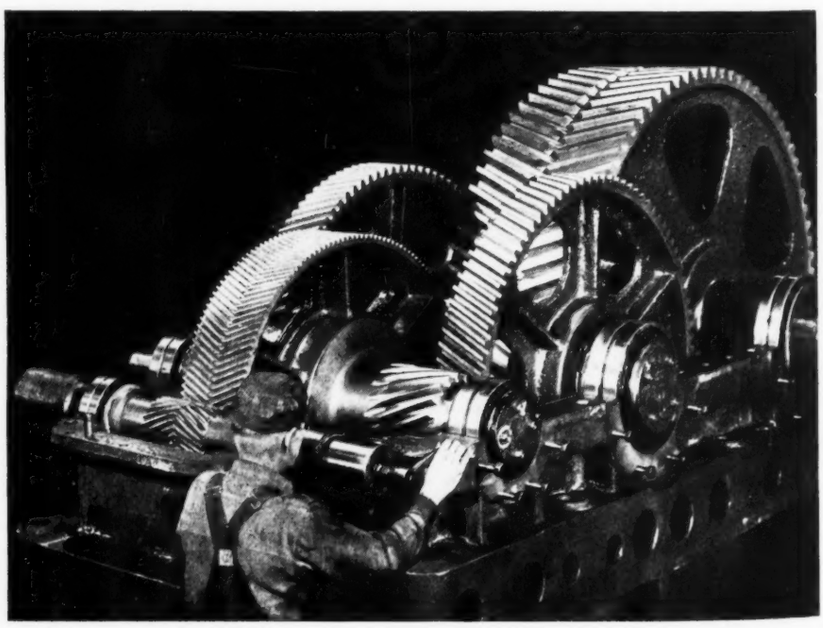


Fig. 6. The Entire Train of a Rolling Mill Triple-reduction Gear Drive can be Easily Turned over by the Application of a Hand-crank

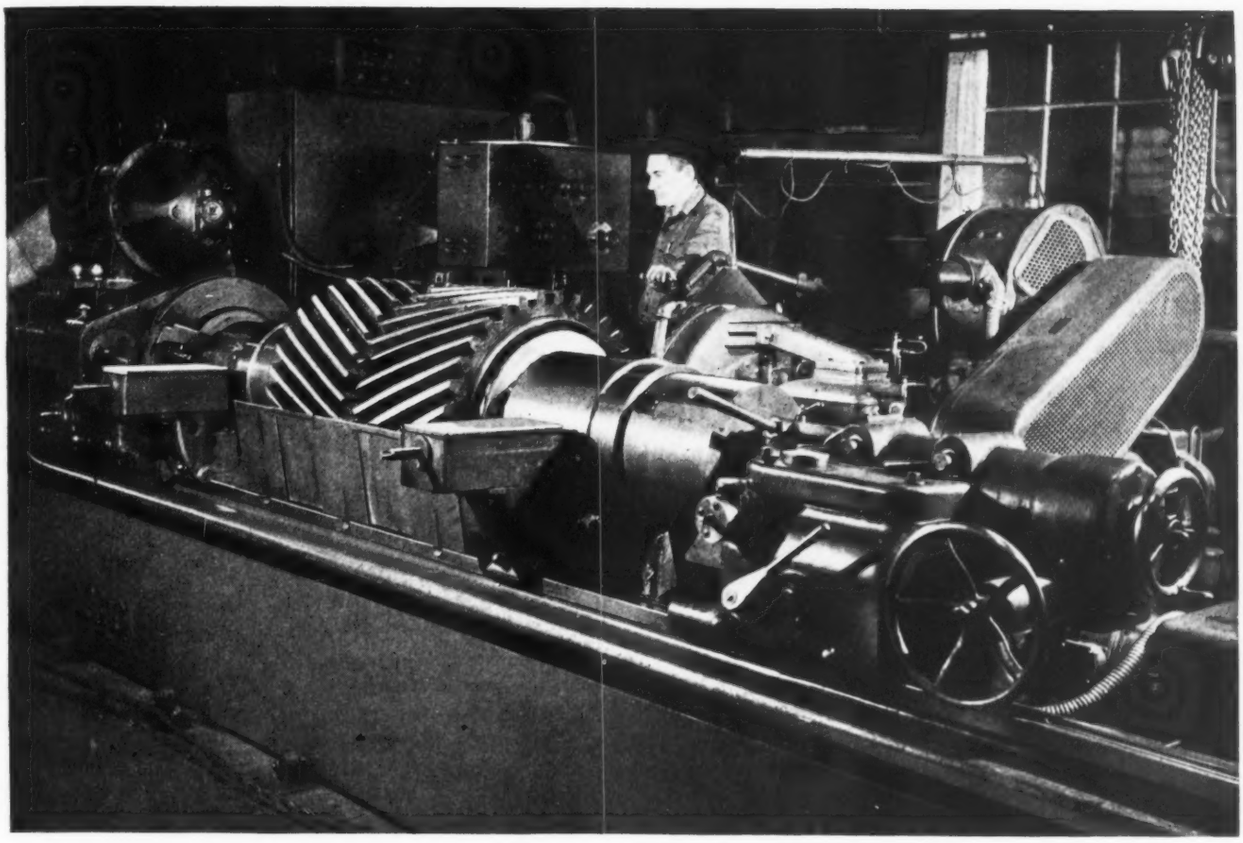


Fig. 7. Huge Roll Grinders of the Type Illustrated are Used for Operations on the Pinions before and after Hobbing

casting of the gear blanks minimizes the balancing problem. It has never been necessary to make a weight correction on the pinions, because they are always closely in balance when they leave the hobbing machine.

The Gear and Pinion Teeth are Lapped after Assembly

After the gears and pinions have been assembled in their housings, they undergo a lapping operation, in order to insure uniform and quiet meshing of their teeth. This operation is performed even though the maximum face misalignment of gears and pinions 48 inches in width, as they come from the hobbing machines, is only 0.004 inch. The average misalignment is as small as 0.002 inch.

The meshing contact of all teeth is determined by applying Prussian blue and revolving the gears. Lapping compound is then brushed over the teeth and the gear train is run at one-half its operating speed, which is about the fastest speed that the gears can be run at without throwing off the lapping compound. The gears are stopped frequently and more compound is brushed on their teeth. After rough-lapping, a lighter compound is used for finish-lapping. At the end of the operation, the tooth contact is again checked by the application of Prussian blue.

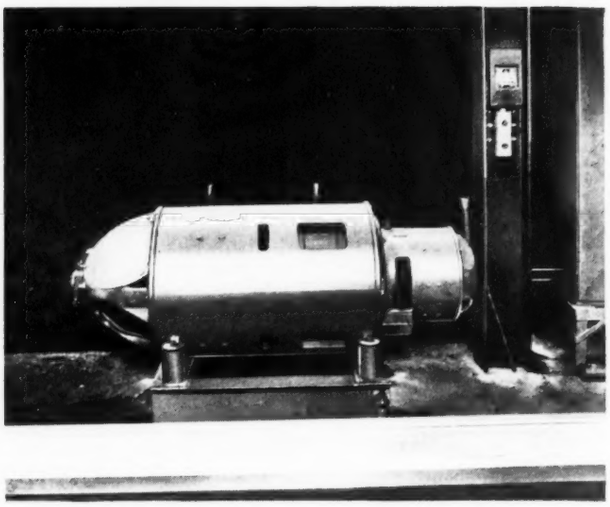
Less than one-half hour is usually required for lapping the gear and pinion teeth until all contact points are smooth and the load pressure constant for the entire width of the teeth. When the lapping compound has been removed, and oil provided in the case, it is often possible to turn an entire train of gears by merely applying a hand to the driveshaft; in Fig. 6 the gears of a large triple-reduction drive are being turned by the application of a hand-crank. This easy running feature results from the accuracy of the gear and pinion teeth and the fact that the shafts are mounted in antifriction bearings.

* * *

Even those of us who are old enough to have a clear recollection of what happened in the development of the automobile industry thirty years ago are at this late date hardly able fully to appreciate the position of the automobile at that time. In April, 1907, Harry M. Rubey, president of the Missouri Automobile Association, urged upon the members the necessity of avoiding the hostility of drivers of horses. He advised Missouri motorists that whenever they encountered a team of horses on the road that gave any indication of being frightened, they should "drive to one side of the road, hiding their machine, if possible, behind a clump of trees, emerge gently, take the bridles of the horses and lead them past the automobile."

Recent Improvements in Planer Drives

By R. S. ELBERTY,* Electrical Engineer
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.



Motor-generator Set for a 50-horsepower Regulator Planer Drive

THE improvements that have taken place in recent years in metal-cutting planers have created a demand for a more flexible main drive. The constant-voltage direct-current drive for planers furnishes speed ranges as high as 6 to 1. The double commutator motor for planer drives developed in 1929 was a direct result of the demand for equipment that would operate over a wider speed range. This drive furnished a speed range of 10 to 1, but did not provide for much quicker reversal of the platen.

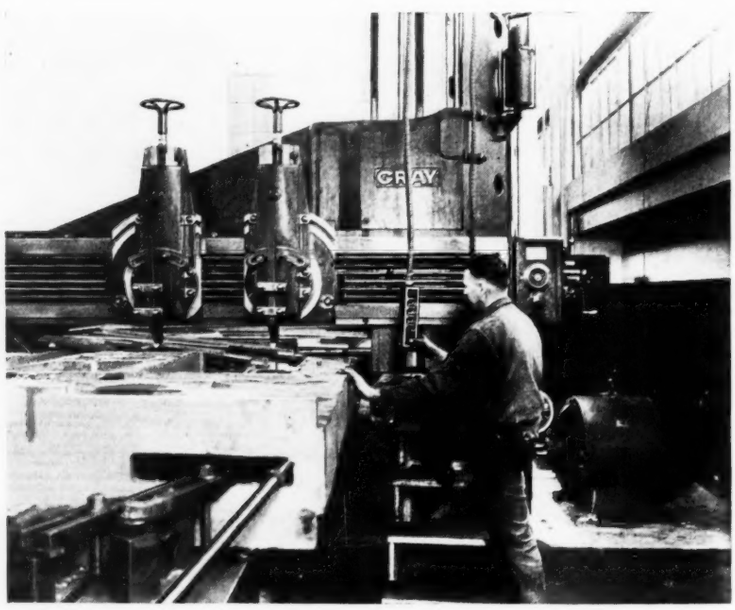
The old variable-voltage drive furnished a relatively wide speed range, but at low speeds and varying loads, the speed characteristics were unstable, and there was always the possibility that the motor would stall. This drive used a wide speed control by motor field, which added the weakness of the constant-voltage drive to that of the variable-voltage generator, as far as rapidity of reversal was concerned. Yet it was quite apparent that the variable-voltage drive was the only true solution to the problem of obtaining a drive to operate over a wide speed range.

*Since this article was written, Mr. Elberty has become electrical engineer with the Landis Tool Co., Waynesboro, Pa.

For some years, modern elevator controls have used a regulator to control speeds with a wide range of loads. This regulator was modified and added to the variable-voltage control for planer drives to improve speed regulation at low speeds. In this construction, the regulator serves as a field-forcing means for the generator, and a very fast reversal of the platen is possible. The regulator drive provides stable operation over a wide speed range, and the new drive does not use motor field control, except for motor speeds above 800 revolutions per minute. One installation has been made with a motor speed range from 30 to 1200 revolutions per minute, but the usual range has been from 40 to 1200 revolutions per minute.

When this new drive was first applied to a planer, the improved performance with regard to speed range and smooth and rapid reversal set a new record in planer performance. A number of these new drives have been, and are now being, built in sizes ranging from 10 to 50 horsepower. Two 35-horsepower drives and one 50-horsepower drive in operation give exceptionally fine performance.

Some actual performance tests have been made on these installations, and a comparison with tests made on the older type of drive shows marked improvements. The actual time for a complete cutting and return stroke may be compared with the theoretical time, to arrive at a figure that might be termed "operating efficiency." For strokes of 60 inches and over, the modern constant-voltage drive shows a fairly good performance, but will not operate over a wide speed range. The real advantage of the regulator drive is apparent on short-stroke work. For the shortest



A 50-horsepower Regulator Drive Applied to a Gray Planer at the Plant of the McKay Machine Co., Youngstown, Ohio

Table Showing Reduction in Electrical Apparatus and Savings Made Possible in Maintenance When Using Regulator-Drive Control

	Constant Voltage	Regulator Drive
Number of relays	8	8
Number of contactors	9	0
Number of electrical contacts	38	22
Relays used in automatic cycle	4	3
Contactors used in automatic cycle	9	0
Number of electrical contacts for automatic cycle	28	8

stroke—3 to 4 inches—the modern constant-voltage drive will permit about thirty complete strokes per minute, while one of the regulator drives was adjusted to give fifty complete 5-inch strokes per minute and forty complete 9-inch strokes.

Operating efficiencies with a 120-inch stroke at high cutting and return speeds run as high as 93 per cent for the new drive, and one test with a cutting speed of 40 feet per minute and a return speed of 80 feet per minute showed an efficiency of 96 per cent. These tests were made on a 36-inch planer, but are typical of the new drive, regardless of size, assuming that the planer is adequately powered.

The amount of over-travel of the limit switches is also an indication of the rapidity of platen reversal. Many good constant-voltage drives overtravel the limit switches as much as 2 feet at high platen speeds. A new regulator type drive with slow-down limit switch showed only a 6-inch overtravel of the limit switches at a platen speed of 163 1/2 feet per minute and a motor speed of 1200 revolutions per minute. This feature provides for greater accuracy and production when working in pockets or against shoulders.

The greater simplicity of the variable-voltage controller, as compared with the constant-voltage type, is an outstanding advantage when considered from the maintenance point of view. The variable-voltage controller consists of eight relays with a total of twenty-two contacts, while the constant-voltage controller has seventeen contactors and relays with a total of thirty-eight contacts. During the automatic operation of the variable-voltage controller, only three of the relays with a total of eight contacts operate, and none of these carries the main motor current. In comparison, during the automatic operation of the constant-voltage controller, thirteen contactors and relays with a total of twenty-eight contacts operate and nine of these are making and breaking the main motor circuit.

The regulator drive provides for emergency braking, which is not affected by power failure. The platen can be "inched" in either direction at low speeds, and the extremely wide range of cutting and return speeds provides a flexible machine suitable for a wide range of work. This new electric drive keeps pace with the mechanical improvements that have been made by the planer builders.

What Industry Expects of Engineering Graduates

SOME time ago, Professor Frank L. Eidmann of Columbia University decided to investigate how satisfactory industry is finding the young engineering graduates. He sent a questionnaire to about sixty firms, nearly all of whom replied. A summary of the answers will prove of interest alike to engineering educators, young engineers, and mechanical executives.

1. "In what type of work do you employ young mechanical engineering graduates—design; research; production; sales?"

Twenty-five per cent of the firms stated that they employed young engineers in all four types of work; a few employed them in design work only. In total, approximately 75 per cent employ engineering graduates in design work, 50 per cent in research and test work, 75 per cent in production, and 50 per cent in sales.

2. "Approximately what percentage of these engineering graduates turn out to be satisfactory?"

This was a difficult question to answer. Only 60 per cent of the answers contained specific figures. Of these, 28 per cent said that between 20 and 50 per cent of the men proved satisfactory; 16 per cent gave a range of between 50 and 70 per cent; while another 28 per cent gave an estimate of between 70 and 85 per cent. Five per cent of the firms gave a figure as high as 85 to 90 per cent, while a few had estimates as low as 10 and 12 per cent. One firm commented that about 90 per cent turned out to be reliable, hard working employes, but not more than 25 per cent, and probably less, turned out to be top-notch engineers or salesmen. The companies that reported a high percentage of successful men also mentioned that they made a very careful selection in the first place.

3. "What, in general, appears to be the trouble with those in whom you are disappointed—personal traits, training, or some other reason?"

With but few exceptions, the dissatisfaction seems to have been due to personal characteristics in the men. The fault most often mentioned is the young man's inability to get along with his associates. Other outstanding faults are: "Over-eagerness for advancement and unwillingness to prepare for advancement over a long enough period;" "lack of aptitude for engineering work;" "inability to adapt themselves to the routine of operating work and, at the same time, avoid getting into a rut;" "lack of initiative;" "lack of self-confidence."

4. "Do you have a training course for engineering graduates?"

Eighty per cent of the firms that replied stated that they had a training course. The courses vary from six months to three years. Some companies have well developed educational programs, while others simply place the young men for a period of time in each important department.

5. "Do you prefer that your engineers should have taken specialized courses or that they simply have acquired the fundamentals in science and engineering?"

All except one employer expressed strong preference for fundamentals. Occasionally, however, a man is selected because he has specialized in some subject of particular importance to the company.

6. "What weight do you give to non-engineering subjects—such as English, public speaking, economics, and government?"

About 15 per cent gave considerable weight to English in writing and speech; about the same number emphasized economics; none gave any weight to a study of government. As typical of 50 per cent of the replies, this is quoted: "In hiring young engineering graduates, we have not stressed the importance of non-engineering subjects, but we feel that they are essential to the success of any graduate and that they will help materially in his making progress."

7. "Do you prefer men who have taken a year or two of post-graduate work?"

Only one employer answered "yes" to this question; 16 per cent preferred engineers with four-year courses, except for research or highly specialized work; a few stated that they much preferred men who have not had graduate work.

8. "Are you satisfied with the training which mechanical engineering students receive in a four-year course?"

Nearly all the replies were to the effect that the training is generally satisfactory, although it was emphasized that there is room for improvement. One executive answers, "A four-year course is enough; the average young graduate is just raw material anyway. It takes about two years to make him worth his pay, except in rare instances." One employer writes, "We are not completely satisfied with the training in *all* engineering colleges. We feel that more effort should be given to the study of fundamentals of science and engineering, rather than to too specialized subjects, which is done in some schools."

9. "In what way do you believe that four-year courses in mechanical engineering may be improved?"

A number suggested the elimination of specialized courses and concentration on fundamentals; a large percentage suggested that the students receive instruction in fundamentals of business organization and administration; quite a few would like to see more instruction tending to make the young men "cost-minded;" several felt that attention should be given to instruction in salesmanship as applied to engineering; a number believed that more emphasis should be placed on practical shop work, especially for engineers who intend to enter production work.

10. "What additional comment would you make?"

In reply to this question, broad fundamental training was emphasized. The objection of many engineering graduates to work on the drafting-board was cited. It is believed by many executives that work on the drafting-board is essential to later success in the solving of engineering problems. It was also suggested that faculty members should be encouraged to spend some of their summers in industrial work. One reply emphasized the value of the so-called cooperative courses, especially for designing and production work; and one engineer emphasized the value of campus activities to men who are to become leaders of other men in executive positions.

* * *

A Formula for Tap Drill Sizes

By JOHN L. SKEEHAN

An easily remembered formula for determining tap drill sizes for American National threads may be written

$$d = D - \frac{1}{N}$$

in which

d = tap drill size, in inches;
D = outside diameter of tap, in inches; and
N = number of threads per inch.

This formula will provide about 77 per cent of a full thread. It is generally agreed that not over 75 to 80 per cent theoretical depth of thread is required for strength, nor is it desirable from the standpoint of tap life.

Should it be desired, however, to obtain more nearly a full thread, the formula may be modified as below:

$$d = D - \frac{1.15}{N}$$

If less than 77 per cent of the full thread is desirable, the formula may be written

$$d = D - \frac{0.85}{N}$$

Obviously, the nearest tap drill size to the figure obtained from the formula is used.

* * *

A special study, including periodic examination of 100 electric welders employed by the Westinghouse Electric & Mfg. Co., presented no evidence of health impairment resulting from this type of work. Dr. T. Lyle Hazlett, medical director, said that it is believed that there is almost no danger from welding provided ventilation is adequate.

Burnishing Broaches with Rings of Solid Tungsten Carbide

By GEORGE EGLINTON, Vice-President
Lincoln Park Tool & Gage Co.
Lincoln Park, Mich.

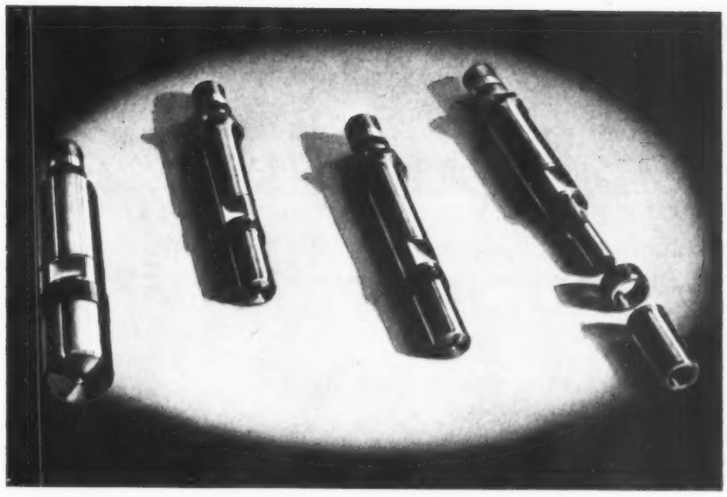


Fig. 2. Sizing and Burnishing Punches Made with a Single Solid Ring of Tungsten Carbide for Use on Bronze Bearings of the Oilless Type

BURNISHING broaches used in finishing the bronze sleeves of automobile knee-action units and spring hangers have been found to last from forty to sixty times as long when made with rings of Carboloy cemented tungsten carbide, in combination with rings of chromium-plated tool steel, than when made all of tool steel and chromium-plated.

These new broaches are made by the Lincoln Park Tool & Gage Co. with a tool-steel mandrel on which there are seven integral rings, as shown in the central view of Fig. 1. Eight solid rings of tungsten carbide and a like number of spacers made from hardened tool steel are assembled on the mandrel in front of the integral rings, and then a three-ring tool-steel pilot is placed in front of the tungsten-carbide rings. When the nut is tightened on the mandrel threads, the assembled broach has the appearance seen in the upper view of the illustration. Both the pilot section and the integral rings are chromium-plated.

In using this tool to burnish the split rolled bronze from which the knee-action sleeves are made, the first six tungsten-carbide rings do actual swaging, each succeeding ring being ground 0.0015 inch larger in diameter than the preceding ring. The last two tungsten-carbide rings, as well as the integral tool-steel rings in back of them, "size" the hole. This burnishing broach expands the bearings 0.009 inch, but the hole contracts 0.001 inch after the burnishing operation.

As the tungsten-carbide rings become worn, they can be moved forward on the mandrel and new rings of the maximum size provided. The tungsten-carbide rings are fitted to the mandrel with a clearance of less than 0.00005 inch, as determined by a Sheffield shadow gage, so as to guard against crushing when the broaching pressure is applied. In the original design of Carboloy burnishing broach made by the Lincoln Park Tool & Gage Co., the tungsten-carbide rings were used where the integral tool-steel rings are now provided, but it was soon learned that the tungsten-carbide rings should be located at the points where the actual burnishing is done.

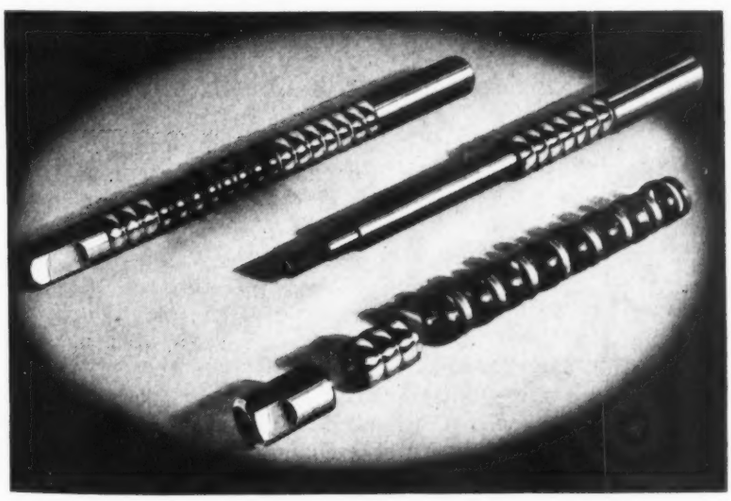


Fig. 1. Burnishing Broach, Assembled and Disassembled, which is Made with Swaging Rings of Solid Tungsten Carbide, in Addition to Chromium-plated Tool-steel Piloting and Sizing Rings

The broach shown finishes to a nominal diameter of 1.033 inches. It is 12 inches long over all, including the shank and nut. The Carboloy rings are each 1/4 inch long and have a bore of 0.750 inch. The greatly increased life and reduced "down" time of the punch press on which the tool is used make the larger initial tool cost a profitable investment.

Punches used for burnishing and sizing oilless bronze bearings are made with a single ring of solid Carboloy, as shown in Fig. 2. The Carboloy rings on these punches range from 1/2 inch to 1 1/2 inches outside diameter, and from 1/2 to 1 inch in length. These punches are also used in a punch press and are made so accurately that there is not more than 0.0001 inch of run-out on the tungsten-carbide ring when the punch is revolved on centers, with a dial indicator checking the rotation.

Devising Production Methods for Small-Quantity Manufacture

Some of the Methods Used to Control Manufacturing Costs in a Plant that Makes 75,000 Different Parts

By ASHLEY BROWN, Chief Inspector
The Ohmer Fare Register Co., Dayton, Ohio

LOW-COST production methods are comparatively easy to devise in industrial plants where the manufacturing volume is sufficient to keep machines busy year in and year out producing the same part. The problem is much more difficult, however, in plants required to produce a great variety of parts in relatively small quantities. In such cases, care must be taken constantly to avoid excessive investment of capital in the multitudinous jigs, tools, gages, etc., that may be required to insure interchangeable manufacture of all parts.

Forty-five thousand different parts are carried in stock by the Ohmer Fare Register Co., Dayton, Ohio, for assembly into the thirty-two registers, taximeters, and mileage recording instruments manufactured by the concern. In addition, there are approximately 30,000 parts termed "inactive" which are also stocked in limited quantities for products built with more or less special features. This makes a total of 75,000 parts for which the shop must be equipped to produce as the demand requires. Obviously, caution is necessary at all times under such a condition to keep manufacturing costs to a minimum.

A Simple Die-Casting Die that Produces Twenty Different Pieces

Great economies have been effected in the production of die-castings by so designing the dies, whenever possible, that one die set can be used for casting a number of similar pieces. Twenty different pieces are cast with the die set illustrated in Fig. 1 by the use of the interchangeable "nests," seen at the left in Fig. 2, which form the front and back of the die cavity. These nests are of the same outside diameters, but differ in the number and shape of the cores, the shape of the cavity, etc. Also, some of the cores are adjustable in and out, so as to enable the same nest to be used for casting parts that are identical, except for longer or shorter hubs, etc.

Typical parts produced in this die set are shown at the right in Fig. 2. It will be seen that some of the pieces have numerals cast around the rim, while others are plain. Various numerals or other characters can be obtained by simply interchanging character bars in the slots that extend radially from the cavity of the die seen at the left in Fig. 1. These character bars are closed radially into the casting position by moving the die handle to one side, and are withdrawn when the casting operation is over by imparting a reverse movement to the handle. All parts of this die exposed to the molten metal in making die-castings are of tool steel. The die is used for zinc die-casting.

Thirty of these interchangeable dies have been made so far. One set produces forty different parts.

Adjustable Jig Facilitates the Locating of Small Gears on Shafts

In the manufacture of cash registers, a large number of shaft assemblies are required on which small gears must be mounted, fairly accurately, in positions that differ widely with the individual shafts. The assembly of these gears on the shafts has been facilitated by means of the simple, adjustable jig shown in Fig. 3. This jig consists essentially of a base with tongue-and-groove ways at the front and back to receive small locator slides. There are also two stocks for supporting the shafts.

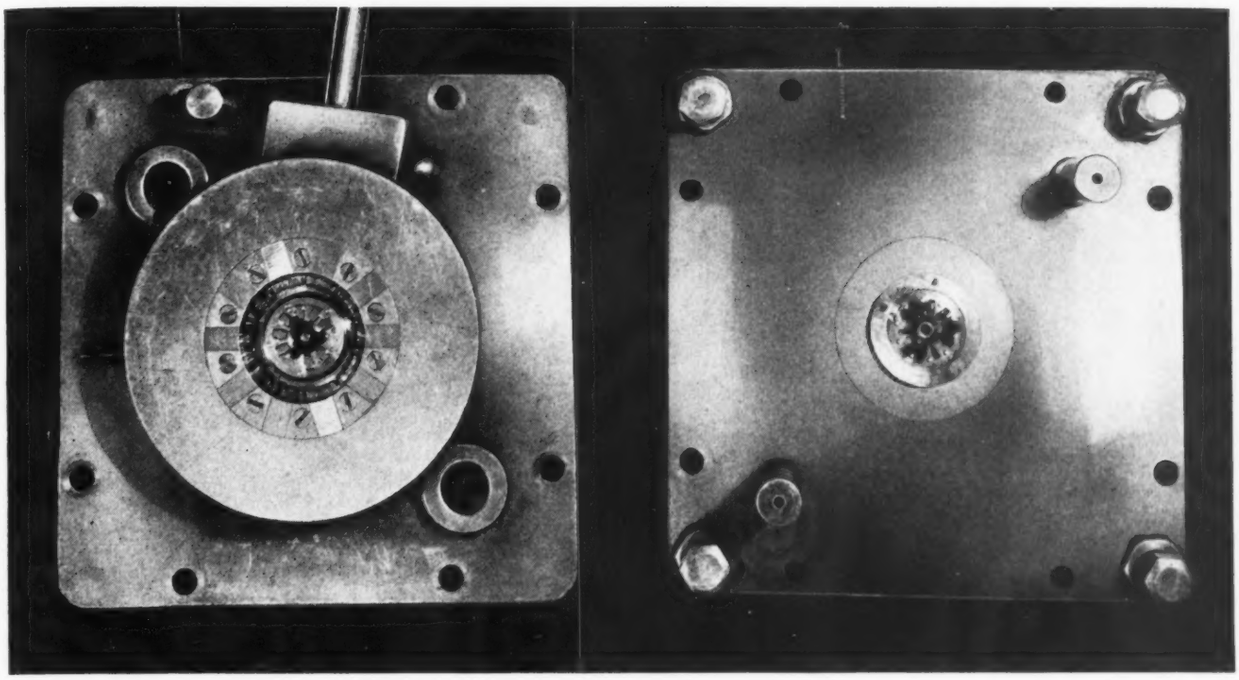


Fig. 1. Die-casting Die Made with Interchangeable Nests that Enable Twenty Different Parts to be Cast at Minimum Die Expense

The locator slides at the back are each fitted with a bar that extends forward toward the center of the jig to provide a means of locating gears lengthwise along the shaft. One face of the gear being located is simply pushed against this bar for positioning. Then a V-shaped finger on the corresponding front locator slide is entered between two teeth of the gear to locate the teeth in correct relation with those of other gears on the same shaft. When all the gears of an assembly have been located in this manner, dowel-pin holes are drilled through the gear hubs and the shaft. Then the assembly is removed from the jig and dowel-pins are driven through the gear hubs to attach them to the shaft.

From one to four gears are located on shafts by this method, the practice being to accurately adjust and clamp the locator units along the base as required for one assembly, and then put through a quantity of similar assemblies before changing the settings of the locator slides. This one jig is employed for as many as fifty different pinion-shaft assemblies.

Punch press dies can sometimes be made adjustable to suit slightly different parts. The die illustrated in Fig. 4, which is used for punching a small slot in the rim of parts such as seen at the front of the die, is so constructed that piercing punches of different dimensions and shapes can be interchanged. It is necessary, of course, to make a corresponding change in one of the inserts of the cylindrical plug on which the stamping is seated for the piercing operation.

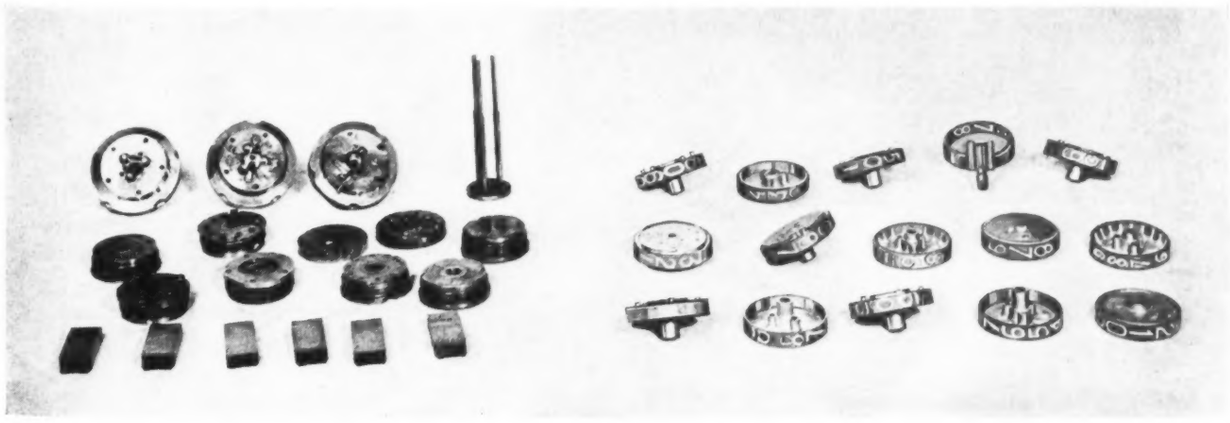


Fig. 2. (Left) The Different Nests that can be Interchanged in the Die-casting Die Shown in Fig. 1, and Six Character Bars. (Right) Some of the Twenty Different Die-castings that can be Cast in the Die Illustrated in Fig. 1

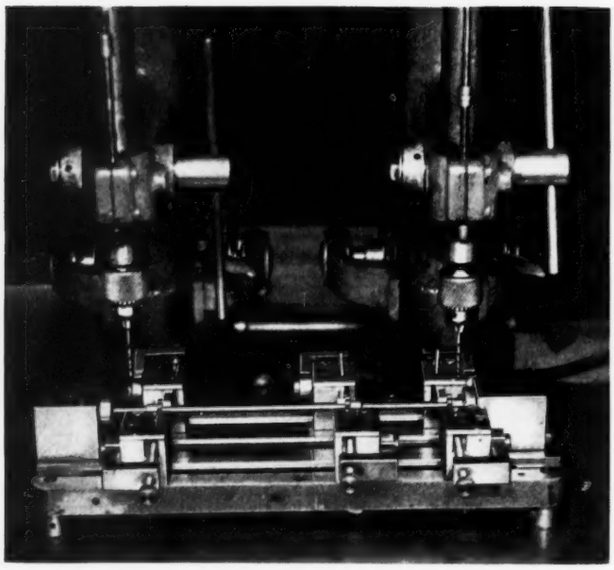


Fig. 3. Adjustable Drill Jig Employed in the Accurate Assembly of Small Gears on Fifty Different Shafts

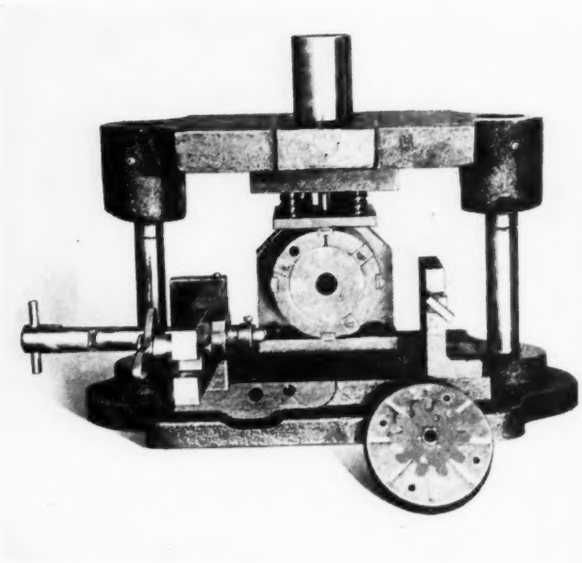


Fig. 4. Piercing Die with Interchangeable Punches of Different Shapes and an Indexing Work-holding Plug

In addition, this cylindrical plug can be indexed to change the location of the pierced slot with respect to other elements of the part. The work is located circumferentially on the plug by means of two pilots on the hinged clamp which engage teeth on the stamped gear of the work-piece when the clamp is swung shut.

Inexpensive Temporary Dies of Cold-Rolled Steel

Blanking dies that consist simply of a loose flat punch having the contour of the required blank, a flat die with a corresponding hole, and a stripper plate are made up from cold-rolled steel and case-hardened for a large variety of pieces required in quantities of less than 100. They are used for stock up to about 1/8 inch in thickness. Dies of this type cost only from $15 to $18, whereas the cost of a standard type of blanking die made from high-grade steel and designed to be attached to the press ram would be prohibitive for the small quantity of parts required, even though the rate of production might easily be tripled with such a die.

The "temporary" die shown in Fig. 5 produces blanks such as seen in front of the die, which are 4 1/2 inches long by 2 inches wide by 1/8 inch thick. The strip stock is simply fed by the operator from right to left between the stripper plate and the die. He places the flat punch on top of the stock within the opening of the stripper plate. When he depresses the foot-treadle of the press, the flat plate attached to the lower end of the ram strikes a sharp blow on the loose punch, forcing the punch and the blanked piece through the die opening. Dies similar to this are made from oil-hardening steel for quantities of work up to 2000 pieces.

Engraving machines used for cutting numbers, letters, and other characters on wheels and other register parts, as shown in the heading illustration, were originally fitted with a simple bracket designed to hold one or more character templets in a straight line. In engraving a series of numbers around a wheel or other part, it was necessary to replace the templet each time that the wheel was indexed in order to cut different numbers. Sometimes it was necessary to change three or four characters for each indexing of the work.

The engraving machines are now fitted

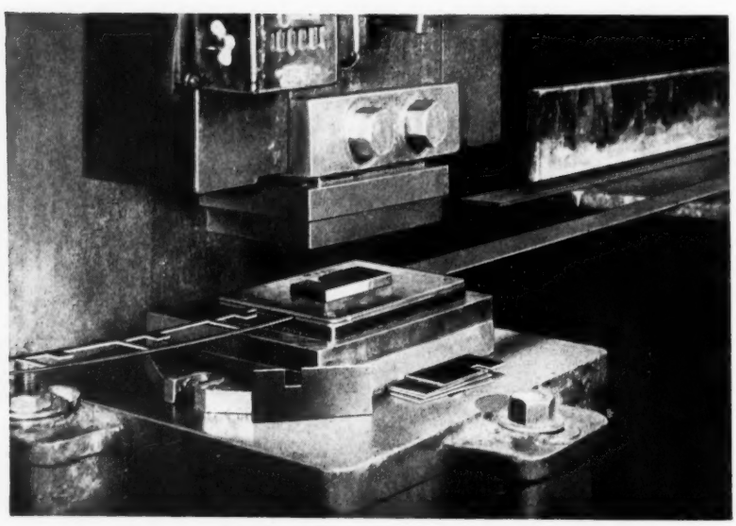


Fig. 5. Blanking Dies with a Flat Punch that is Not Connected to the Press Ram Permit the Inexpensive Blanking of Limited Quantities of Work

Fig. 6. Machine Equipped with a Templet Dial that Enables a Large Number of Letters to be Engraved without Changing Templets

Fig. 7. View of the Small Pot Furnace in which Large Quantities of Work are Casehardened by Liquid Carburizing

with dials, as seen in the heading illustration, that are indexed into position beneath the tracer. All the characters required for a part can be provided on such a dial and any number of similar pieces can therefore be engraved without changing a single templet. Different dials can readily be substituted when jobs are changed. Fig. 6 shows a machine equipped with a larger dial on which character templets can be mounted in groups of three. These templet dials are used for work on which characters must be engraved in straight horizontal rows, as well as for circular work.

Liquid Carburizing is Employed in Casehardening Many Parts

A considerable proportion of the many parts that go into the registers must be casehardened. The practice formerly was to pack the work in boxes with carbonaceous materials, heat the packed boxes in a furnace for a considerable length of time, and then remove the work-pieces from the carbonaceous materials, and quench them in oil. This lengthy and somewhat dirty practice is now used only for work-pieces that are hardened locally, in which case the surfaces to be left soft are either copper-plated or protected by clamping other pieces to them.

Seventy per cent of the parts, by weight, that must be casehardened are now immersed in a liquid carburizer for a predetermined length of time and then quenched in oil. Liquid carburizing has been found much cheaper and cleaner than the pack carburizing method, and at the same time, it gives a more uniform depth of penetration, due to the fact that the carburizing liquid flows between the pieces.

The small oil-fired pot furnace seen in Fig. 7, which has a pot 10 inches in diameter by 14 inches deep, is used in liquid carburizing. Work is either suspended in the carburizing liquid from rods, as shown, or immersed in wire-mesh baskets. The length of immersion depends upon the desired depth of penetration. For a case from 0.001 to 0.002 inch thick, the work would be immersed for approximately ten minutes, whereas for a case 1/32 inch deep, the work should be immersed for approximately an hour.

"Hardcase" liquid carburizer, made by the A. F. Holden Co., New Haven, Conn., is used. It comes in the form of crystals, which are added in quantities of four pounds per day to maintain a bath. The pot is heated to temperatures of from 1390 to 1700 degrees, depending upon the work.

* * *

General Electric Pension Payments

Pension payments amounting to $2,499,893 were made to 3214 retired employes by the General Electric Co. last year. During the year 144 employes retired from active service, while 222 retired employes died. The average age of retired employes is 68.7 years, and the average continuous service is 29.5 years. The average annual pension is $768. Of the assets of the General Electric pension trust at the end of the year, $41,197,153 was paid in by the company, and $11,035,388 by the employes. Since 1912, when this pension plan was inaugurated, $20,747,887 has been paid to employes.

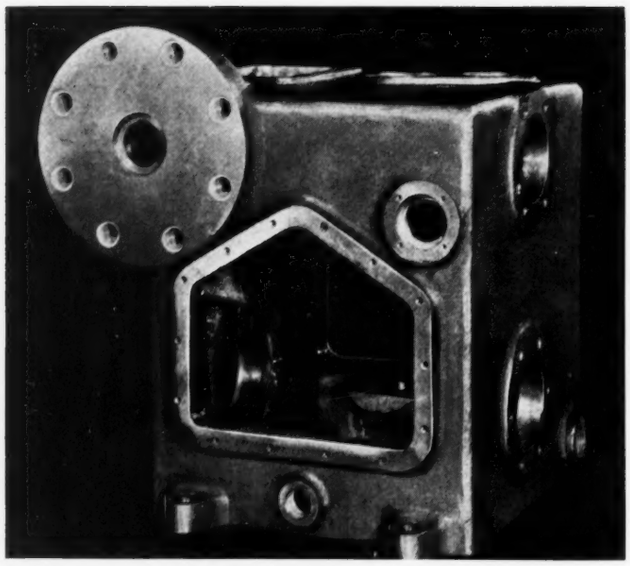


Fig. 1. A 200-pound Housing Fabricated from Welded Steel Plate

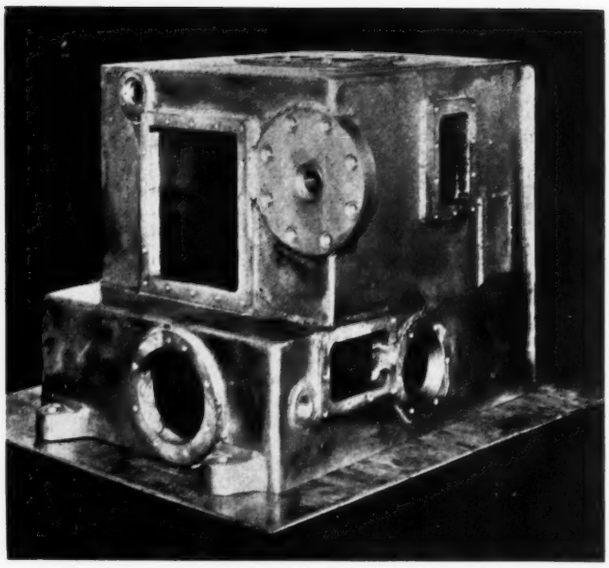


Fig. 2. An Intricate Welded Assembly of Many Pieces of Steel

The Machine Designer Attains Greater Proficiency in Welded Fabrication

By E. C. POWERS, Assistant Secretary
The James F. Lincoln Arc Welding Foundation
Cleveland, Ohio

MANY articles have been written and many illustrations shown to point out the advantages of steel plate fabrication in the manufacture of machinery. Cost reduction, faster production, greater serviceability, and lighter weight—these and other incidental advantages have resulted in a steadily increasing adoption of the welding method in machine building.

It is not the purpose of this article to further emphasize these advantages. Rather, it is intended to examine plate fabrication with reference to one consideration only—a consideration that has received more and more attention as the use of the method has increased. This is the appearance of the finished product.

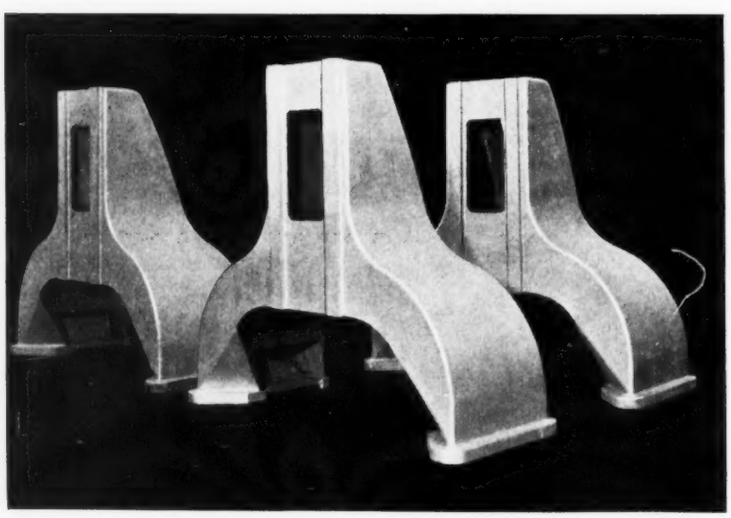


Fig. 3. Plate Fabricated and Welded Columns for Boring Machines

There was a time when little could be said for the appearance of plate fabricated or welded products. Even today manufacturers will tell you that appearance is the principal objection to the use of this method. They object to the straight lines, square corners, sharp angles, etc., that have characterized welded products in the past.

This line of thought is, however, rapidly giving way to a new idea. Designing engineers, gaining experience in the use of steel plate and welding, have developed very pleasing designs in steel plate. Products are being manu-

factured today from steel plate that are as attractive in appearance as those produced by other methods. In addition, the steel plate products have the inherent advantages previously mentioned.

The accompanying illustrations show what can be accomplished when a skilled designer directs his attention to the matter of appearance. Fig. 1 shows a housing weighing 200 pounds; Fig. 2, another housing weighing 400 pounds; Fig. 3, columns for boring machines, each column weighing 2200 pounds; Fig. 4, frames for a press and for spot-welding machines; and Fig. 5, a table for a broaching machine. These machine parts are products of the Taylor-Winfield Corporation, Detroit, Mich. The welding is done by the shielded-arc process.

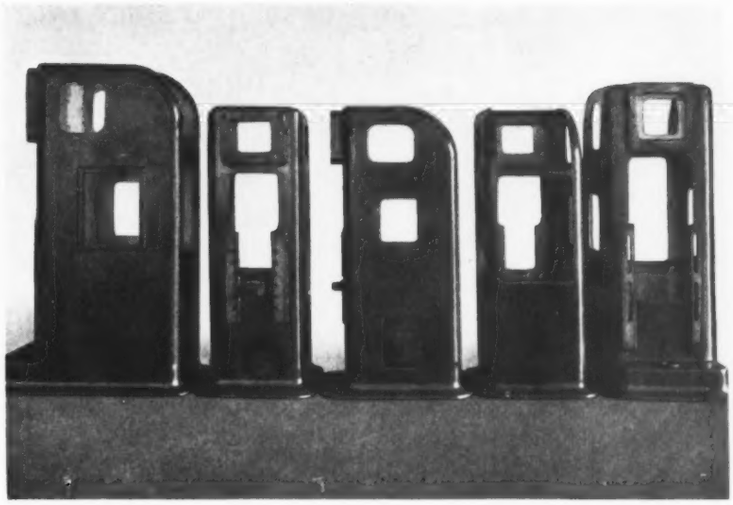


Fig. 4. Frames for a Standard Press and for Spot Welders, All Fabricated from Plate by Welding

At first glance, one might think that these housings and frames were produced by conventional methods. Nevertheless, each housing or frame is built from steel plates, joined by electric welding. No materials except standard steel plates are used, yet the finished products appear as integral pieces of metal, apparently formed in a mold. There are no sharp corners, square openings, nor straight lines that might be unpleasant to the eye.

Because of its advantages as a manufacturing process, steel plate fabrication by electric welding is certain to receive more and more attention from engineers and designers. Eventually, as experience with this new method equals that with more conventional methods, the designs produced in steel plate will be as attractive in appearance as those produced by other methods. It is expected that the $200,000 award program of the James F. Lincoln Arc Welding Foundation will prove a great stimulus to the study of steel plate fabrication by engineers and designers. Doubtless, it will quicken progress toward a recognition of the advantages that are offered by this new method in machine manufacture.

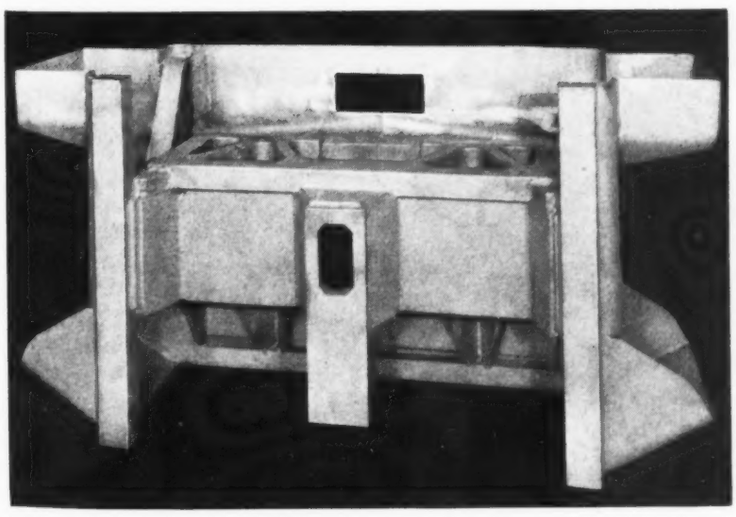


Fig. 5. A Welded Table for a Broaching Machine

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Machine Tool Electrification Forum

The 1938 Machine Tool Electrification Forum, or third annual meeting of machine tool builders and electrical equipment manufacturers, will be held at the East Pittsburgh Works of the Westinghouse Electric & Mfg. Co., May 9 to 11. The purpose of the meeting is to discuss more accurate and finer control to meet the increasing needs of industry.

The program will include papers on special and difficult problems presented by representatives of machine tool builders. Talks will also be given by Westinghouse works, application, and design engineers. Inspection trips will be made through the Westinghouse Research Laboratories and manufacturing plants to observe recent developments.

* * *

It is stated that five times as much type can be set on a modern linotype machine as a highly skilled compositor working by hand could set in 1890. This apparently supports the theory that improved machinery, by replacing hand labor, causes unemployment. Yet the statistics of the printing industry show that there are five times as many compositors employed in that industry today as there were forty years ago. Here is another case where the machine has increased employment rather than decreased it.

Engineering News Flashes

The World Over

Forgings of Out-of-the-Ordinary Dimensions

Some forgings of dimensions not generally met with in engineering practice have recently been made by the Krupp company of Essen, Germany. Owing to the development of high pressures in engineering and chemistry, pressure vessels designed for gases and fluids under several hundred atmospheres pressure are no longer unusual. For such high pressure, seamless rather than riveted drums must be used. The Krupp company recently completed one such drum, forged in one piece, approximately 60 feet long, 4 feet in diameter, and weighing 182,500 pounds. For holding and manipulating such enormous forgings under the heavy forging presses, a 300-ton crane is employed, the hook of which is a forging weighing over 15,000 pounds.

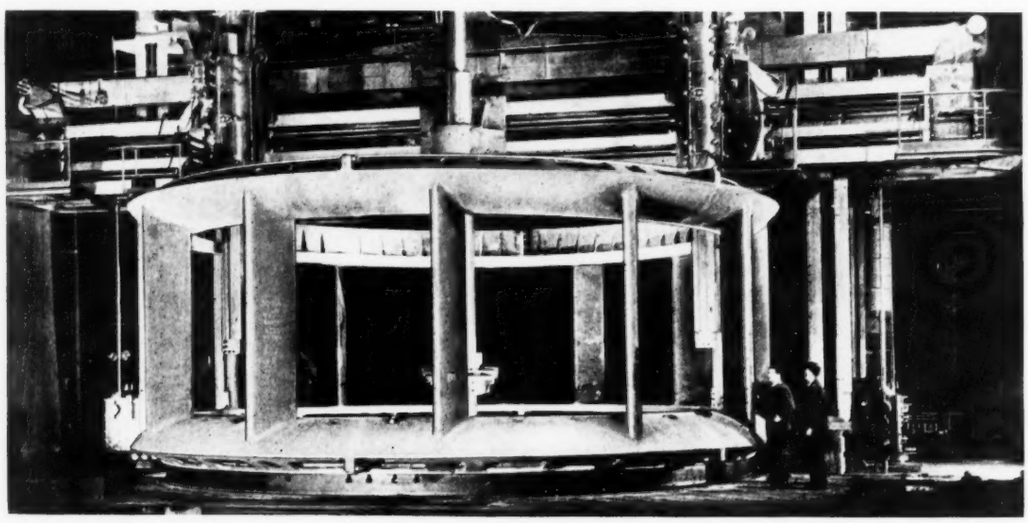
Hot Water for Household Use from the Sun's Rays

It is said that more than 12,000 residents of Miami, Fla., depend on the sun for providing hot water for household purposes. A glass tank containing coils of copper tubing is placed on the roof. Through this arrangement, enough heat is absorbed from the sun's rays to bring the temperature of the water up to 200 degrees F. It is claimed that in six hours hot water to last the average family three days can be run off into a thermos type reservoir. Complete installations sell for about $175.

Telephones that Make Automatic Records for Billing Subscribers

One of the limitations of the regular automatic dial telephone is that it does not record the length of the conversation, and hence does not automatically limit the subscriber to a three-minute conversation period. In Belgium, an automatic system has been introduced that not only records the length of the conversation, but also automatically records all information necessary for keeping the subscriber's account, even in cases where conversations at more than the minimum rate may be dialed directly.

Briefly, the new apparatus records on a tape in the telephone central the number of the subscriber who makes the call, the number that he calls, and the length of time of the conversation. The latter is done by punching a hole in the tape fifteen sec-



Machining One of Two Speed Rings for Two 55,000-horsepower Hydraulic Turbines for the Pickwick Landing Development at the Allis-Chalmers Mfg. Co.'s Shops in Milwaukee, Wis., on a 40-foot Boring Mill. Each Speed Ring Weighs 250,000 Pounds and is 37 Feet 4 Inches in Diameter and 14 Feet 6 Inches High.

The Housing of One of the Two Huge Generators Being Built for the Pickwick Landing Dam Development in the Shops of the Westinghouse Electric & Mfg. Co. at East Pittsburgh, Pa. The Outside Diameter of the Housing is 44 Feet. These Generators are Rated at 40,000 KVA–13,800 Volts

onds after the connection has been made. After three minutes, another hole is punched; and from that moment on, a new hole is punched for each minute of conversation. When the connection is cut off, the tape is cut. The piece of tape contains all the information relating to the conversation necessary for billing, and prevents any arguments between subscriber and telephone company, since an actual record is available.

Reducing Weight of Jigs and Fixtures by Welding

According to James Weaver, director of equipment, inspection, and tests of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in an address before the American Society of Tool Engineers, the Westinghouse company made careful cost studies of 200 welded jigs, and compared them with the cost of similar jigs of conventional design. Savings up to 45 per cent were indicated on drill jigs, and up to 15 per cent on milling fixtures. Besides, the jigs were from 10 to 25 per cent lighter in weight.

The Metals that We Eat

It is quite generally known that an adequate supply of calcium, magnesium, and iron are essential to a normal and healthy condition of the human body. It is not so well known, however, that copper, zinc, manganese, arsenic, and aluminum also play a part in nutrition.

According to a report of the American Public Health Association, it is now generally agreed that copper is necessary in the human diet—in extremely small quantities, of course. Practically all foods contain the necessary amounts of both iron and copper in the form of salts of these metals. Zinc is also required and is present in many foods in a fair amount. Milk, for example, contains more zinc than it does either iron, copper, or manganese.

The report concludes with a definite statement that normal amounts of aluminum are harmless. This should help to lay at rest the query frequently made as to the effects of the use of aluminum cooking utensils. Aluminum is normally present in food supplies of both plant and animal origin.

Nickel Alloy Castings for Railway Cars

Increases in the operating speeds and decreases in the dead-weight haulage of both passenger and freight equipment have been marked tendencies in railroad developments during the last few years. The designer has turned to nickel steels and other nickel alloys in finding materials suitable for the construction of rolling stock to meet the new requirements. An important development in this field has been that of light-weight truck castings for freight cars made of normalized nickel-manganese steel. This steel was first developed commercially in 1935. During the first nine months of 1937 over 4000 freight cars were provided with truck castings of this type, as compared with 2650 in the entire year of 1936.

Fifty Years of Pneumatic Tires

When one considers the complete dependence of modern transportation on pneumatic tires, and the hundreds of millions of pneumatic tires that have been made and used, it seems rather surprising to contemplate that such tires did not even exist in the childhood of millions of people who make use of them today. The Dunlop Rubber Co., Ltd., of Birmingham, England, the earliest producer of pneumatic tires, is just celebrating the fiftieth anniversary of this invention, which was patented July 23, 1888. First used on bicycles, it soon became one of those fundamental contributions of engineering progress that made the automobile practicable.

EDITORIAL COMMENT

Who Can Best Plan Industrial Production Needs?

For several years, it has been the dream of some of the advisors of the Administration that the production planning for all industry should be done by government bureaus in Washington. If this hoped-for planning for industrial production should follow the pattern of the planning for agriculture, as embodied in the farm bill, it would spell the end of the industrial supremacy of the United States and of our high standard of living. Yet, there are many well meaning dreamers, including men holding high government positions, who believe that such governmental planning for industry would be highly desirable.

Planning industrial production, like planning farm production, is too big a problem to be handled by a centralized bureau or department. It is true that production planning as handled by industry in the past has, at times, resulted in an unbalanced output of goods. Nevertheless, it is obvious that it is better to have a thousand minds conversant with individual markets and conditions do the planning, each with the welfare of his own individual enterprise in mind, than to have a few master minds in Washington, with no financial responsibility for their mistakes, assume such a gigantic task.

Experience of the Past is the Safest Guide

Were centralized production planning feasible, we would find it applied to our large corporations that have scores of plants in manufacturing centers throughout the country. Certainly, in that case, one would expect to find a centralized production-planning department at the main headquarters of the corporation; and yet the most successful of these large corporations, with far-flung interests, are not attempting to plan the production schedules through the application to the problem of master minds in a central office. On the contrary, the most successful combinations are those that have given to each of their subsidiary plants the greatest possible leeway in managing their own affairs, in planning their production and sales quotas, and in handling their own problems within the broad general policies of the corporation.

If experienced business management has found the latter plan to be better in cases where it has complete ownership and control, it certainly would not be logical to expect that a few government officials could successfully assume the vast responsibility of planning production for the industries of the entire nation. The methods of industrial management that have been applied in the United States have given this country the highest average standard of living in the world. In this country, millions of people look upon comforts that are considered luxuries in other countries as everyday necessities. Everything can be improved, and there are improvements possible in industrial management methods; but let us be wary of radical and sudden innovations that may cause irreparable damage.

Selling by Praise Instead of Selling by Knocking

In spite of all the rules laid down in books on successful salesmanship, there still are a goodly number of salesmen who believe that one can best impress a prospective customer by knocking the competitor's product. If there were statistics available on the subject, it probably would be found that more sales have been lost by this error than by any other fault of the salesman.

Some years ago, there was an unusually successful machine tool salesman in one of the middle western territories. His selling tactics were somewhat different from those pursued by most salesmen, even by successful ones, but the "proof of the pudding" was that he got the orders. His method of selling might have been termed "selling by praise" rather than "selling by knocking." He boosted his competitors in order to boost himself.

As an example, let us assume that he sold lathes. He started out by praising all his competitors' lathes, by telling of the great advances in the design, construction, materials, speed, power, and rigidity that had been made in this line of machine tools. He called attention to the improvements made by his competitors and emphasized their value—and then he clinched the argument by pointing out that *his* lathes had all these improvements and a few others added for good measure. If the customer really needed a lathe, it is small wonder that the salesman usually got the order. Selling by praise strengthens the confidence of the customer in the product; selling by knocking raises a question mark in his mind.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Variable-Speed Transmission

By WILLIAM SHAW

The variable-speed drive shown diagrammatically in the accompanying illustration was designed by the writer to replace the cone-and-belt type of drive employed on certain textile machines. It can, however, be applied to machines in other industries where a sensitive control is required which will respond instantly to a very slight variation in speed.

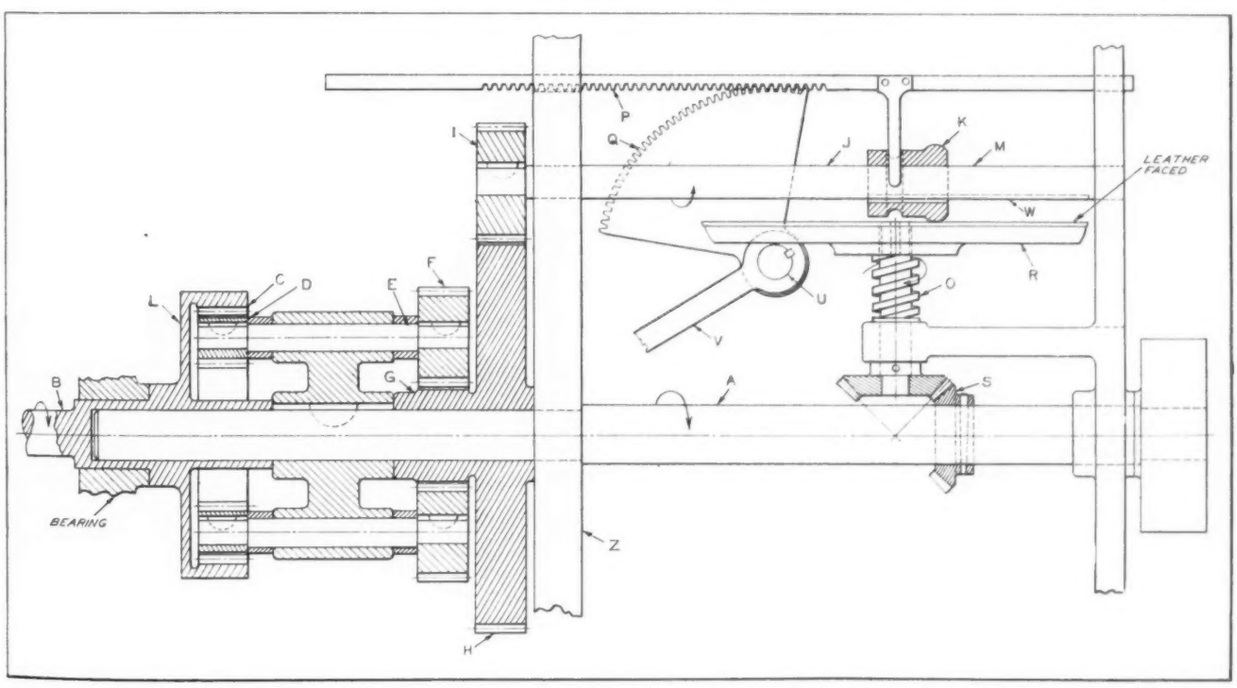
The main shaft *A* is driven at a constant speed. The shaft *B*, which provides the desired intermediate speeds, is cast integral with a sleeve *L*. Lever *V* is keyed to the quadrant shaft *U* and is located outside of the mechanism housing. This lever is connected to the "evener motion" which controls the drive, causing it to increase or decrease the speed of shaft *B* as required. The position of the quadrant *Q* indicated in the diagram shows that shaft *B* is being driven at nearly its maximum speed. When the small hardened-steel friction-driven roller *K* is almost at the center of the leather-faced disk *R*, gear *I* on shaft *J* and gear *H* will be almost at a standstill. Gear *G*, being integral with *H*, will also be practically at a standstill.

When gear *G* remains in a fixed position, shaft *B* is driven at its highest speed. Thus, if quadrant *Q* moves the shifting rod *P*, and consequently, the small friction roller *K*, toward the periphery of disk *R*, so that the speed of gear *G* is one-fifth greater than the main shaft *A*, shaft *B* will be at a standstill. From this it will be clear that a slight movement of quadrant *Q* will make a great difference in the speed of gear *G*. The spring *O* insures driving contact of roller *K* and disk *R*. The pressure exerted by spring *O* is just sufficient to prevent slippage and yet allow roller *K* to slide on shaft *M*, with its key sliding in keyway *W*. The main shaft does all the work and the small roller and disk serve as governors only. The gears to the left of wall *Z* are enclosed and run in oil.

Switch-Operating Mechanism

By L. KASPER

The lever arrangement shown in the accompanying illustrations is used on a machine for winding special springs, which is reversed frequently by



Mechanism for Varying Speed of Driven Shaft

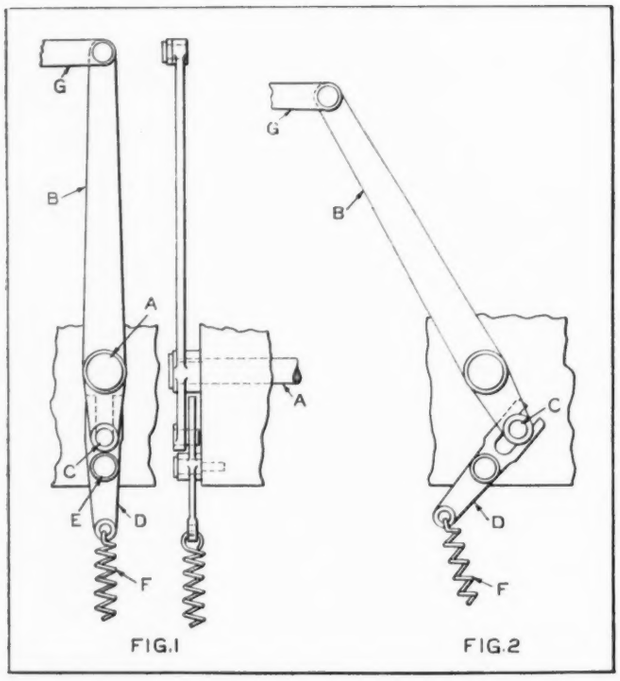


Fig. 1. Switch-operating Mechanism in Neutral Position.
Fig. 2. Switch Mechanism about to Make Contact

reversing the driving motor. The reversals are controlled by a double-throw drum type switch having sliding contacts. The lever mechanism serves to hold the switch in the neutral position when the mechanism is stopped to insure full disengagement of the contacts. With this arrangement, complete disengagement of the contacts is effected automatically after the operating lever has been moved to a given position.

The lever *B* is keyed to the shaft *A*, which operates the switch drum. The upper end of lever *B* is connected to the shifter rod *G*. Pin *C* at the lower end of rod *B* fits in the fork at the upper end of the lever *D*, which is free to oscillate on stud *E*. The lower end of spring *F* is fastened to a stationary part of the machine, while the upper end is fastened to the lower end of lever *D*.

The positions of the levers when the switch is in the neutral position are shown in Fig. 1. The tension of spring *F*, acting through lever *D*, serves to hold lever *B* upright. If the shifter rod is given slightly less than its full travel movement, the spring *F* will immediately return it to the neutral position.

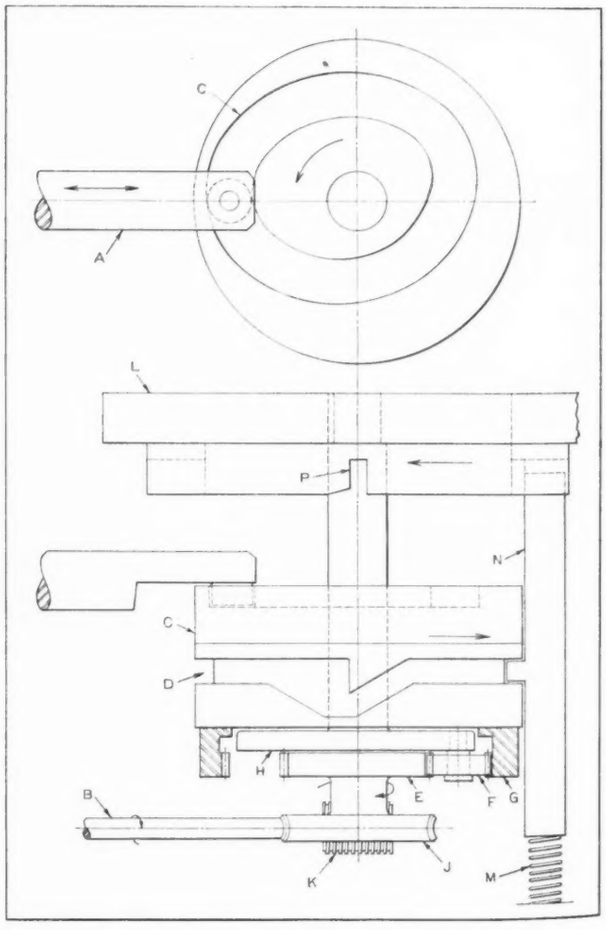
In Fig. 2, lever *B* is shown in the position it occupies just before reaching its extreme left-hand position. At this point, the switch drum has not quite completed its partial revolution, and spring *F*, acting on pin *C* through lever *D*, still exerts sufficient pressure to return lever *B* to the neutral position if the movement of shifter *G* is not completed. However, as the movement of shifter *G* continues to the left, and the levers *B* and *D* more closely approach positions at right angles to each other, the pressure exerted by the fork at the end of lever *D* acts longitudinally on lever *B* and is no longer effective in returning it to the upright position. The switch contacts then remain in engagement until lever *B* is again returned to the position shown in Fig. 2.

Mechanism for Automatically Indexing Work-Table and Feeding Drill

By WILLIAM H. PELLETT

The accompanying diagram shows a mechanism for automatically feeding and withdrawing a drill and then holding the drill in the "out" position while the work-holding fixture is indexed to the next operating position. After the indexing movement has been completed, the succeeding drilling cycle begins automatically and the cycle of movements is repeated.

The drilling fixture is mounted on the indexing plate *L*, and is indexed by planetary gearing, which also drives a cam that controls the feeding and withdrawing movements of the drill. The sun gear *E*, which is driven continuously by the worm *K* and worm-wheel *J*, furnishes the drive for both the indexing and drilling movements. An interlocking device is provided, which locks the indexing plate *L* while the drill is being fed, and then locks the



Mechanism for Indexing Work-table and Feeding Drill

drill feeding cam while the table is being indexed. Thus the indexing and drilling movements follow each other automatically and continuously.

Immediately below the indexing plate or table is the indexing ring, which is provided with slots *P*. These slots may be located at any desired position in the ring to give the angular indexing movements desired. Plate *L* and the indexing ring are connected to the spider *H* which carries the planetary gears *F*, only one of which is shown. Rod *A* is moved in and out by cam *C* and is connected to the drill feeding mechanism which it operates. The interlock or stop-bar *N* is supported by spring *M* and is moved vertically by cam *D*. Cams *C* and *D* and the internal gear *G* are all fastened together.

When the mechanism is in operation, with the members in the position shown in the diagram, cams *C* and *D* revolve while the interlock holds the drilling plate or fixture stationary. Cam *C* provides a short dwell at the end of the withdrawing stroke for the drill, at which time cam *D* pulls the interlock *N* downward, thus releasing the fixture plate for indexing, while locking the feed-cam *C*. When the next slot *P* in the indexing ring reaches the position above the interlock *N*, the latter member is pushed up by the spring *M*, thus locking the indexing plate *L* and unlocking the cams *D* and *C*.

In some cases, it may be desirable to provide means for preventing the interlock *N* from being forced back into the same slot *P*. In other cases, a light drag or brake on the plate *L* may be needed to insure having the cam *D* move around far enough to permit the interlock *N* to move upward freely into the indexing slot. The latter condition was found to exist in the case of the particular mechanism illustrated.

New Uses for Nickel Alloys

NEW applications in the use of nickel-alloy steels and cast irons, as well as of other nickel alloys, during the past year indicate a trend toward light-weight designs through the use of materials of greater strength and toughness than available in ordinary steels and cast irons. Some of these new applications were referred to in an article in October MACHINERY, page 122, entitled "New Uses for Nickel Steels and Cast Iron." In the following paragraphs, additional applications of nickel cast irons and other nickel alloys, especially of Monel metal, will be referred to.

Ni-Resist Alloy Cast Iron

Because of the excellent corrosion resistance of Ni-Resist, an alloyed cast iron containing approximately 14 per cent nickel and 6 per cent copper, this material has been adopted for the frames of the butterfly valves that control the water level of certain navigation locks on the Monongahela River. The unusual corrosion problem on this river, a result of pollution by the surrounding coal areas and steel mills which produces a highly acid condition, had previously led to frequent replacement of unalloyed cast-iron frames. Ni-Resist is expected to reduce the necessity for these expensive replacements.

In addition to this and other corrosion-resistant installations, Ni-Resist has found several unique applications because of some of its unusual physical characteristics. Its non-magnetic properties have served to introduce this material for bus-bar clamps on electric furnace bus systems carrying current values as high as 50,000 amperes, thus reducing losses by induction and hysteresis. The high coefficient of thermal expansion of Ni-Resist, which approximates that of aluminum, has permitted its use as cylinder liners inserted in aluminum alloy cylinder blocks. Ni-Resist tops on restaurant, hotel, and galley ranges have been adopted because of its excellent resistance to such heat effects as growth and warpage.

New Applications of Monel Metal

In the field of corrosion-resistant alloys, Monel, pure nickel, and Inconel have found increasing application. Among the more unusual developments is the use of nickel-clad steel for the holds of fishing trawlers. Such linings prevent contamination of the fish and reduce the cost of cleaning and repairing the holds. Inconel is now being employed for springs in marine equipment and in the petroleum industry. One of the most interesting developments of Monel during the past year is its use for non-skid, button-type floor plate on the decks of U. S. Navy vessels and commercial craft, where its resistance to salt water corrosion and wear shows up to particular advantage.

K Monel, containing aluminum, which can be hardened to over 325 Brinell, has exceptional strength when cold-drawn and subsequently heat-treated, in addition to the corrosion resistance of regular Monel. These characteristics have led to its widespread adoption for highly stressed shafting and wearing sleeves in corrosive environments. It has recently been adopted for the cable protector springs on miners' lamp batteries, where service life is reported to be excellent, despite the severe repeated stressing to which these springs are subjected.

S Monel, a sand-cast Monel containing about 4 per cent silicon and having a Brinell hardness in the range of 280 to 325, has proved to be particularly valuable for shaft sleeves and similar ap-

plications, where its non-galling, high-strength characteristics are desirable. Both K and S Monel have recently been increasingly used for non-sparking hand tools employed in powder factories, where the danger of explosions must be reduced to a minimum.

Nickel in Bronzes and Copper Alloys

There has been a growing recognition of the effect of small additions of nickel to high-strength bronzes used for pressure castings. In water pumps, for example, the replacement of a portion of the tin content by nickel has resulted in the elimination of porosity and produced pressure-tight castings having greater strength, toughness, and better machineability than the bronze originally employed. In high-lead bearing bronzes, nickel additions effect a better dispersion of the lead constituent and have produced bearings of higher compressive strength.

The use of 70 per cent copper, 30 per cent nickel tubing in the condenser systems of marine boilers has become widespread. A recent application of this alloy is for sheathing the hulls of lifeboats in order to protect them from marine corrosion and insure their effective service life for a long period of years. This cupro-nickel alloy, in addition to its excellent resistance to salt water corrosion, possesses anti-fouling properties that discourage the accumulation of barnacles and other marine organic growths.

Illustrative of the innovations in the design of magnetic appliances which have become possible through the development of Alnico, a permanent magnet ferro-alloy containing nickel, cobalt, and aluminum, is a new magneto which develops sparks of 50 to 100 per cent greater heat value than conventional magnetos. The high magnetic flux obtainable with Alnico has permitted a novel design, in which the magnets, instead of surrounding the armature, rotate within the field coils, thus resulting in a very compact unit.

One of the oldest uses of nickel is for electroplating. Recently this process has been subject to several developments that have served to widen its field of application. Bright nickel plating has been utilized to produce a finished article in the plating bath without the necessity of any final buffing of the polished surface. A hard nickel plate having a Vickers hardness as high as 440 has been developed for applications requiring unusual wear resistance in corrosive environments. It has been found, for instance, that on cams operating in cellulose acetate, a hard nickel plate is the only material able to withstand the severe service conditions. This high hardness can be produced in heavy nickel plates, and as such, is used to build up the worn parts of machinery. The deposits are usually a few thousandths inch thick, but if necessary, up to 1/2 inch of nickel can be built up in this way.

* * *

Broaching Ratchet Teeth Across Round Bars

By JOHN MARKSTRUM, Chief Engineer
Continental Division, Ex-Cell-O Corporation
Detroit, Mich.

Sixteen ratchet teeth are broached simultaneously on opposite sides of emergency brake ratchets in one of the automobile plants by the use of four broaches, as shown at *B* in the illustration. The work, which is indicated at *A*, is a rod, 9/16 inch in diameter, of S A E 1020 steel. The ratchet teeth are 1/8 inch deep, and they are staggered on the opposite sides of the rod, which leaves a thickness between the roots of the opposing teeth of only 5/16 inch. The over-all length of the broached portion of the rod is 5 inches.

In planning this operation, means had to be provided to overcome the lengthwise and transverse cutting forces developed and the tendency of the part to roll between the broaches. The work is located endwise in the fixture against an adjustable stop and is clamped by turning a crank-handle. The part is removed from the fixture at the end of the cutting stroke, so as to avoid returning the broaches through the cut, thus eliminating unnecessary broach wear.

This fixture and the broaches are used in a machine of vertical design. Each broach is made in two sections having a combined length of 14 inches. The two broach-holders are fastened to a common adapter on the nose of the machine ram, and they are guided in hardened ways in the fixture. Means are provided for adjusting the broaches for depth of cut.

This equipment has broached several hundred thousand emergency brake ratchets without any repairs being required of either the broaches or the fixture.

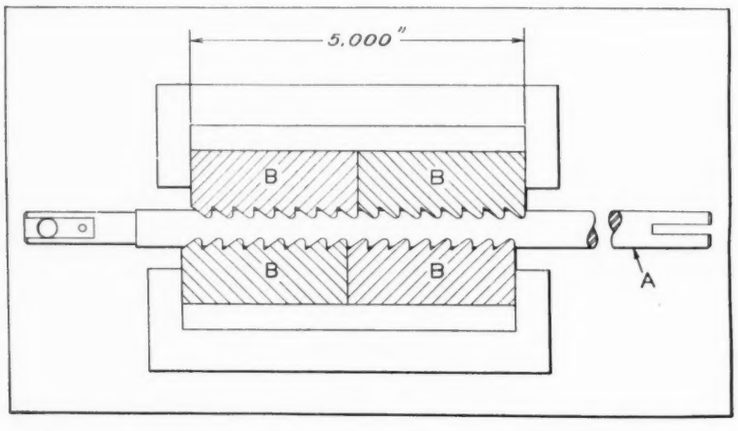


Diagram which Illustrates the Simultaneous Broaching of Ratchet Teeth on Opposite Sides of Round Bars

Die Design and Construction

A Treatise on the Principles Embodied in the Design of Different Types of Large Sheet-Metal Blanking, Forming, and Drawing Dies —Fourth Installment

By CHARLES R. CORY*

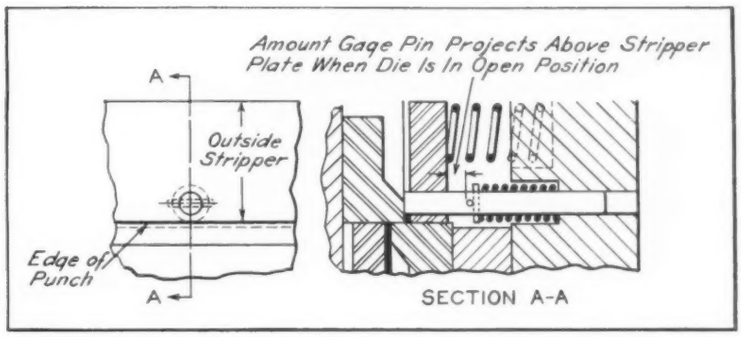


Fig. 9. Typical Disappearing Gage Pin

THE article published in April MACHINERY, page 540, discussed the general principles involved in the design of blanking dies of the return type. The present article will deal with further details pertaining to these dies, and will cover gages, scrap cutters, and shedder pins. It will also present a general comparison of the return and the drop-through types of blanking dies.

Gages for Return Blanking Type of Dies

The method of gaging is similar to that used in a drop-through type of blanking die. Usually disappearing gage pins are used instead of solid ones, if the gage pins are located close to the blank edge. In this way, there is no necessity for drilling a clearance hole in the die proper close to the blanking edge, a condition that is avoided in the case of a drop-through die, where the clearance hole for a solid gage pin would be in the stripper rather than in the die.

The disappearing gage pin, Fig. 9, consists of a pin extending through the outside stripper into the lower shoe. It is forced downward by the die proper, overcoming the pressure of a light spring which supports it. In the open position, it extends above the outside stripper a sufficient distance to gage the stock strip properly.

*Die Engineer, Fisher Body Division, General Motors Corporation, Detroit, Mich.

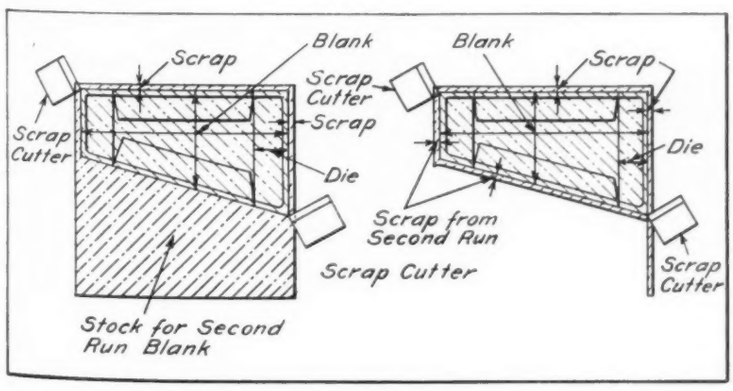


Fig. 10. Diagrammatic View Showing Action of Scrap Cutters

The Use and Construction of Scrap Cutters

Scrap cutters are sometimes used for cutting the scrap into small pieces which can more easily be disposed of. Without scrap cutters, the scrap is a flexible network of approximately 1/8 inch wide ribs between successive blank holes. Since the stock strip may be up to 10 feet long, the stock scrap of a wide blank is sometimes unwieldy enough to require an extra operator at the rear of the press. Another objection to leaving the scrap in one long piece is that it is inconvenient to handle and to bale it. With the use of scrap cutters, the scrap can be cut from the stock strip at each press stroke and be allowed to pile up on the die or shed from the die, according to which is more convenient.

Scrap cutters, as indicated in Fig. 10, are hardened steel sections so arranged as to cut through the stock scrap at two or more points. The use of scrap cutters usually reduces the size of the outside stripper and sometimes eliminates it entirely. When the stripper is eliminated, the scrap falls down on the top of the bottom shoe, where it piles up until it is disposed of. If the scrap is locked in place by the shape of the blank, it still becomes necessary to strip it clear of the punch with an outside stripper. Scrap cutters are more frequently used for large than for small blanks, since the scrap of a large blank is more unwieldy.

Scrap cutters are not ordinarily used for a double-run die, since the stock strip must remain in one piece in order to be fed through the die for the second run. They can, however, be used for a double-run die if the blank is so large that a stock strip for only two blanks is to be used.

Scrap cutters are more often used on return dies than on drop-through blanking dies since large blanking dies

are usually of the former type. As many scrap cutters are used as is necessary to free the scrap. Each piece of scrap will then fall down on the top surfaces of the bottom shoe, unless it can be arranged to shed the scrap off the die by the use of inclined surfaces or chutes. For a simple blank free from notches, two scrap cutters extending from the diagonal corners of the blank to the edge of the stock strip are used. If the scrap cannot be freed with two scrap cutters, three or four may be used.

Different Types of Scrap Cutters Used

There are three different kinds of scrap cutters in general use: (1) The shear type; (2) the notch type; and (3) the chisel type.

The *shear type* of scrap cutter consists of a punch mounted on the lower shoe, as indicated in Fig. 11. It extends from some point on the blank line to a safe distance beyond the side of the stock strip. The level of the top of the scrap cutter is the same as that of the punch. The die must be cut away to clear the scrap cutter. An extra cutting edge is added to one of the die sections to shear along the cutting edge of the scrap cutter.

The die section on the shearing side of the scrap cutter shears the scrap. The die section on the opposite side does not cut the scrap, but only clears the scrap cutter. There are three sections of cutting steel around the scrap cutting point on the blank line: (1) The scrap cutter; (2) one die section, which blanks with its side and cuts scrap with its end; and (3) another die section, which blanks only with its side (see Fig. 11).

The scrap cutter face land must pass upward between the face lands of the two die sections. In the plan view, these three lands meet at the start of the scrap cutting point on the blank line. They must be relieved, so as not to interfere with each other.

The direction and location of any two adjacent scrap cutting lines must be such that the scrap is not "locked" in place. The two scrap cutting lines, therefore, should not be parallel or have an acute angle toward each other. If that were the case, the scrap could not be shed or pulled sidewise.

The scrap is sheared or torn for a short distance on the back side of the scrap cutter cutting edge, and this must be taken into consideration in making sure that the scrap is not locked in. That end of the scrap which lies on top of the scrap cutter land cannot fall down. The question of which end of the scrap or which piece of scrap shall be allowed to fall down and which shall remain on top of the scrap cutter must be decided on the basis of the easiest scrap disposal.

The *notch type* of scrap cutter, as shown in Fig. 13, is a hardened steel cutter mounted on the bottom shoe. It shears the scrap along two sides instead of one, as in the shear type. A V-shaped slug of scrap is cut out by this notching action.

The die section on each side of this scrap cutter shears against the punch with its side and also shears the scrap with its end. The cutting lands of the two die sections must pass down beside the cutting land on each side of the scrap cutter. One disadvantage of this type is the problem of disposing of the extra piece of stock produced.

The *chisel type* scrap cutter (Fig. 12), as the name implies, has a chisel edge. It is mounted on the lower shoe about 1/2 inch below the level of the punch. When a sufficient number of thicknesses of scrap have been piled up, the further downward movement of the pile of scrap will cause the chisel-edge scrap cutter to cut the scrap. This type of cutter cannot be used in a single-run die using a stock strip long enough for more than two blanks, since the stock strip could not be fed until the scrap cutter operated. If the stock strip is large enough for only two blanks, the piling up of the strips before scrap cutting occurs is not so serious. Ordinarily, this type of scrap cutter is never used except when the blank is so large that there is only one blank per stock strip, or for trimming dies in which one formed part is trimmed at a time.

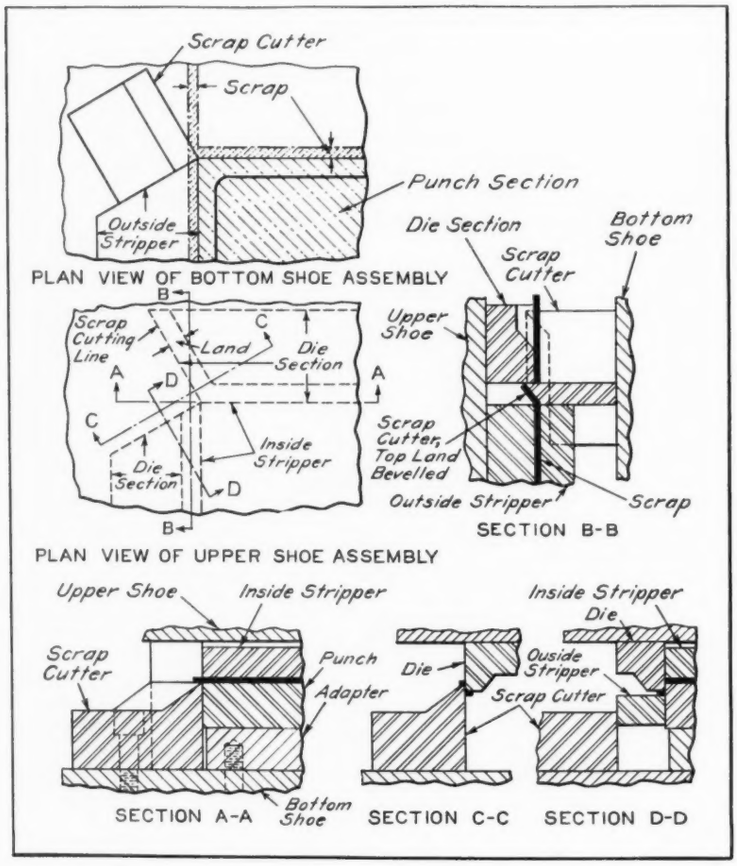


Fig. 11. Shear Type of Scrap Cutter

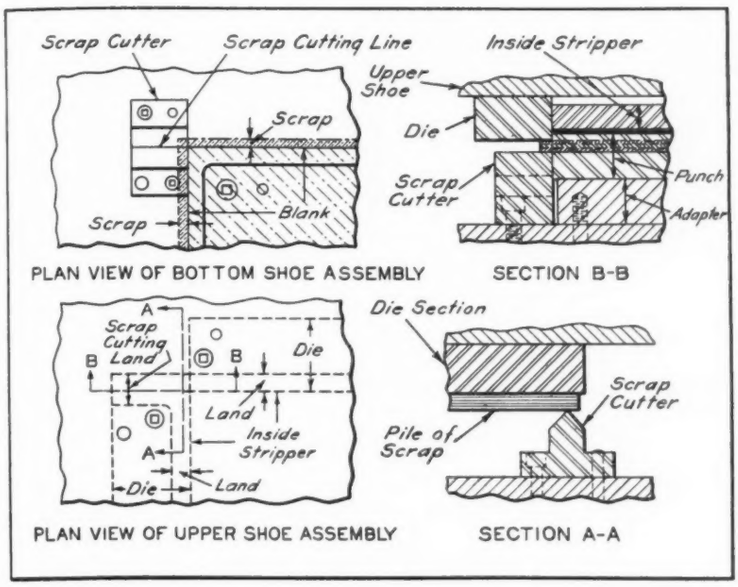


Fig. 12. Chisel Type of Scrap Cutter

If scrap cutters are to be used, the outside stripper is usually reduced in size or else eliminated, as already mentioned. The scrap may not be able to fall free of the punch, in spite of the fact that it is severed from the stock strip, as for instance when it is a press fit between the parallel sides of a notch. In that case, shedder pins may be used to force the scrap from the punch.

Shedder Pins

A shedder pin, as indicated in Fig. 14, has a tapered or inclined top surface and is pressed into the lower shoe, at the notch or wherever the scrap is locked in place. When the scrap drops far enough to come in contact with the sloping top face of the shedder pin, it is forced sidewise, out of the notch.

Shedder pins may not be practical if the notch is deep or if the sides of the notch taper inwardly toward each other, so as to lock the scrap by more than mere friction. In such cases a "local stripper" may be used instead of shedder pins. A local stripper consists of a stripper plate in the notch, operated with spring pressure. It strips the scrap out of the notch outline of the punch. With a local stripper it is necessary, however, for the operator to remove the scrap after each operation. There is an advantage, therefore, in shedding the scrap by means of a shedder pin rather than returning it with a local stripper. In some cases, the local stripper may be so located that the scrap rotates out of the way and slides off the stripper.

If the scrap is to fall down on the lower shoe surface when cut off, the end gages overhang the stock strip and are fastened to the lower shoe beyond the sides of the stock strip, as shown in Fig. 14. The scrap can then be pulled off the shoe under the overhanging gages. If overhanging gages were not used, the pile of scrap would have to be lifted out from between the punch and gage side walls, where there is a tight fit for the scrap.

A return blanking die is ordinarily used only when a drop-through blanking die cannot be employed, since the return type is slower in operation, due to the method of disposing of the finished blank. If the return type die has a spring-operated knock-out, the blank is forced back into the blank hole and the operator has to separate it from the stock by shaking the strip after each stroke. When the blank is a large one, this process may require a second operator at the rear of the press.

If the die has a positive knock-out, the blank falls on top of the stock strip when it is knocked out. In cases where the blank is small, the operator may catch the falling blank with a wooden paddle, but if it is large, it may be necessary to remove it separately with tongs before feeding the

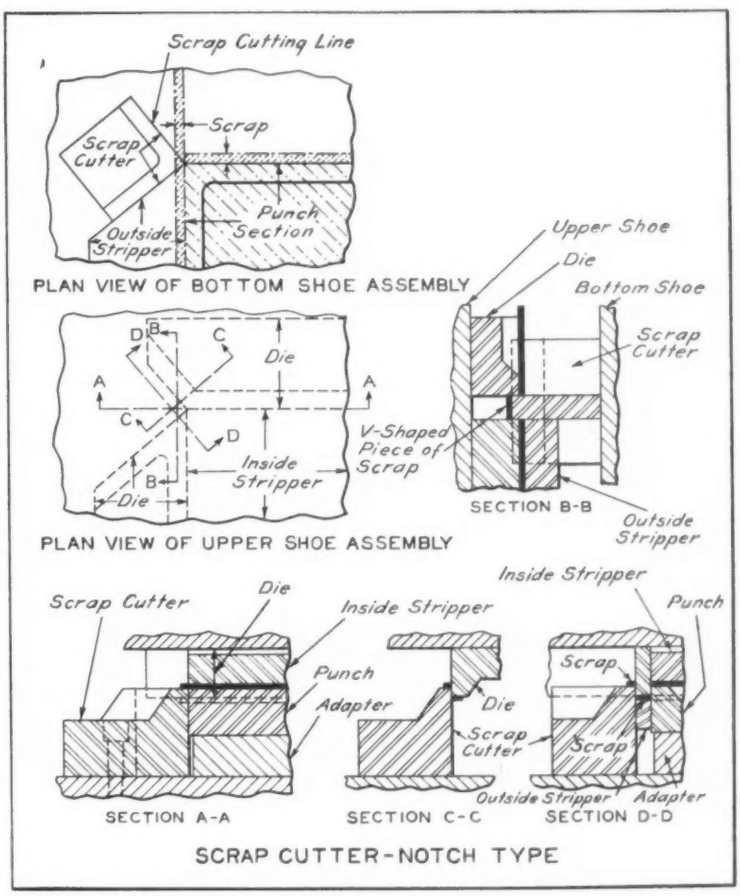


Fig. 13. Notch Type of Scrap Cutter

stock strip. The return blanking die also costs more to build, since a blank knock-out must be provided.

Although the drop-through type is preferable, the following conditions require a return type of die: If the blank is long, the necessarily wide blank knock-out channel of the drop-through type might make the die-shoe too weak. The die would be supported for a long distance on the "bridge" of the die-shoe casting over the blank knock-out channel. The thicker the stock, the greater is the blanking pressure, and therefore, the stronger should the bottom shoe be. If the available shut height is sufficient, it is possible to use a thick bottom shoe, which will be strong enough to support the blanking pressure on the blank channel bridge without breaking.

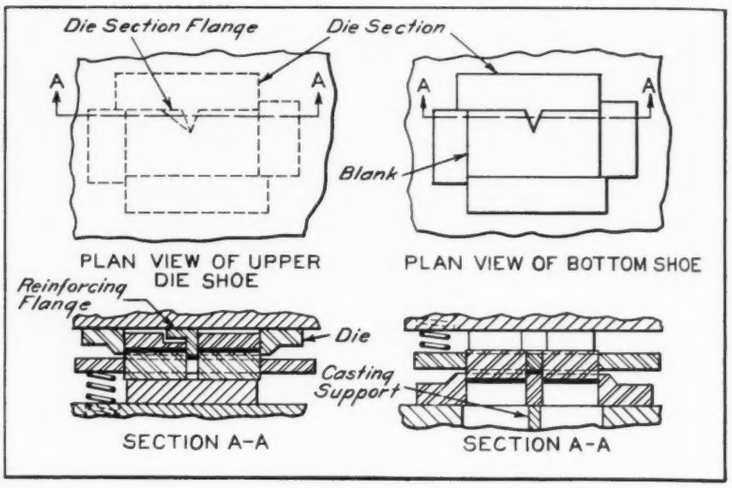


Fig. 15. Diagrammatic View Illustrating a Case where the Shape of the Blank would be Such that the Die Sections would be Too Weak for the Ordinary Drop-through Die

The shape of the blank might be such that the die proper would not be supported sufficiently well in a drop-through type of die. If the blank has a narrow notch of considerable depth, the die has a long narrow tongue for blanking the notch. The casting under this tongue of the die section will be weak and may not support it sufficiently. If a return blanking die were used for the same part, the die section would be the upper member and would be supported by the upper shoe. In that case, the tongue of the die would be well supported, since there is no drop-through hole in the upper shoe to weaken the die support.

The shape of the blank might be such that the die sections themselves would be too weak for the use of a drop-through die; but in a return type, a narrow tongue in the die could, for example, have a ledge or flange connecting it with the main body of the die, as shown in Fig. 15. The knock-out plate of such a die would have to have the proper clearance for this flange. There should be at least 1/4 inch vertical clearance, in the closed die position, between the knock-out plate and the die reinforcing flange. The die can then be ground off at various times for sharpening to the extent of a total of 1/4 inch before there is interference. The die edges are sharpened by grinding off the cutting face and not the wall, since that would change the side die clearance.

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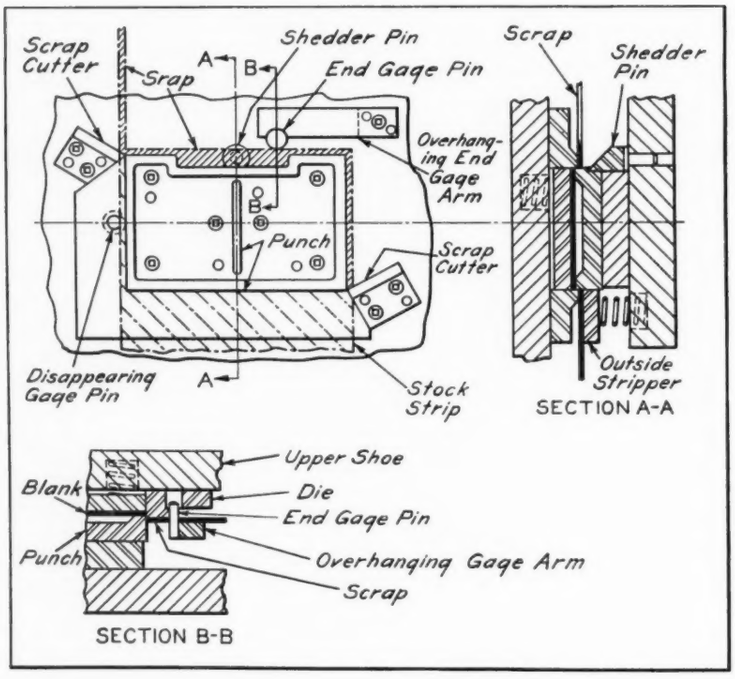
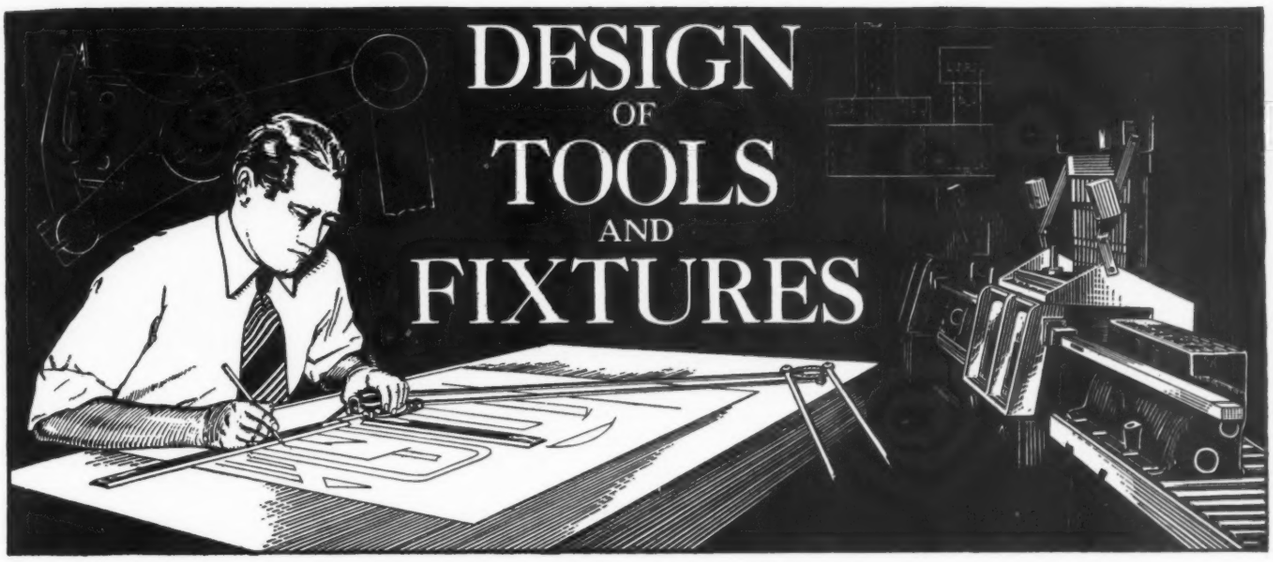


Fig. 14. Arrangement of Shedder Pin

The Allied School of Mechanical Trades, which is maintained by the Allied Screw Machine Co., Inc., Lake and Jefferson Sts., Chicago, Ill., is offering scholarships totaling $400 in value to be awarded to winners in a contest closing on midnight, May 31, 1938. Prizes will be awarded for the three best articles (not exceeding 300 words) on the subject "The Importance of the Machinist and Tool and Die Maker to Industry." Prominent industrialists will be the judges.

The first prize will be a combined Allied Metal Trades course, valued at $250, covering practical training, day or evening, in precision machinist work; tool and die making; tool and die designing and drafting; and automatic screw machines. The second prize will be $100 to be applied on a course selected by the winner, and the third prize will be a partial scholarship of $50 applied on a course to be selected by the winner. Further information can be obtained from the company.



Skeleton Type Grinding Fixture

By J. R. WHITTLES, Holden, Mass.

A skeleton type grinding fixture for use in grinding the face of a chilled iron form to a radius of 10 inches for its entire length of 54 inches is shown in the accompanying illustration. Because of the shape and size of the work *W* (shown by the heavy dot-and-dash lines), it is less expensive to make the fixture as shown, using separators and rods, than to use a solid iron casting. Made in this way, the fixture is also much lighter in weight and easier to operate in the grinding machine.

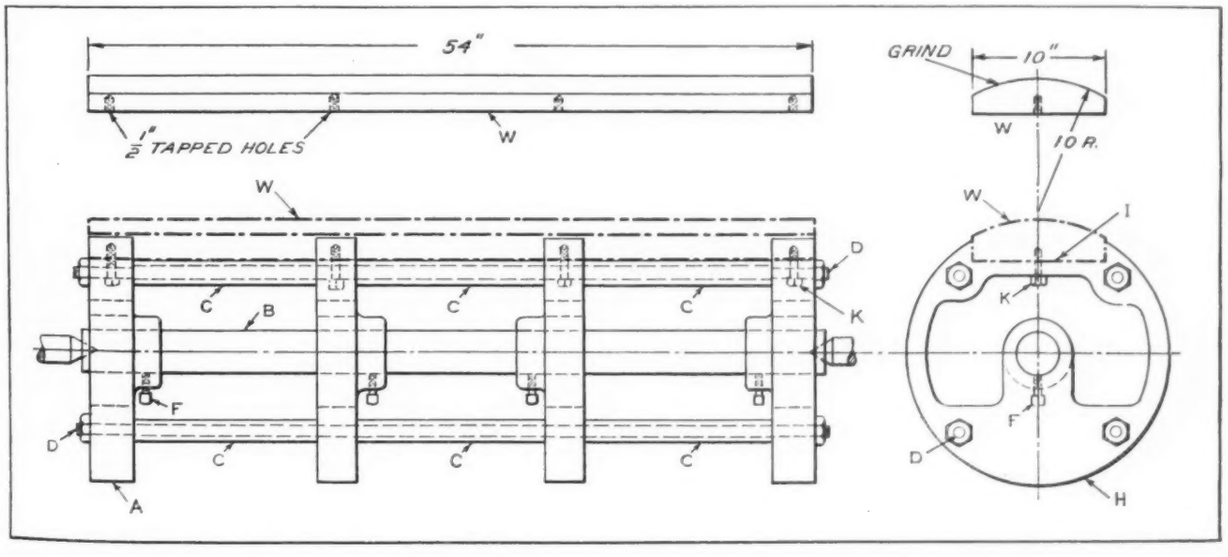
The four cast-iron circular forms *A* of the fixture are cored, as shown in the end view, to provide access to the four fastening screws *K* that hold the work in place in a machined slot at *I*. Sufficient metal is left at *H* to balance the work properly. The forms *A* also have reamed holes which fit over the arbor *B*. Set-screws *F* are provided to hold the forms in place.

The wrought-iron pipe separators *C*, cut to exact lengths, with accurately squared ends, are slipped over the cold-rolled steel tie-rods *D*. Rods *D* are threaded at both ends to fit the hexagonal nuts used to hold the fixture together. The assembled fixture is placed between the grinding machine centers and driven by a pin in the headstock faceplate.

Three-Spindle End-Milling Device with Automatic Feed

By JOSEPH WAITKUS, Wellsville, N. Y.

Frequently it is desirable to make a single tool or fixture that can be adjusted to take care of certain variations in the style or arrangement of the



Skeleton Type Fixture Used in Grinding 10-inch Radius on One Side of 54-inch Bar

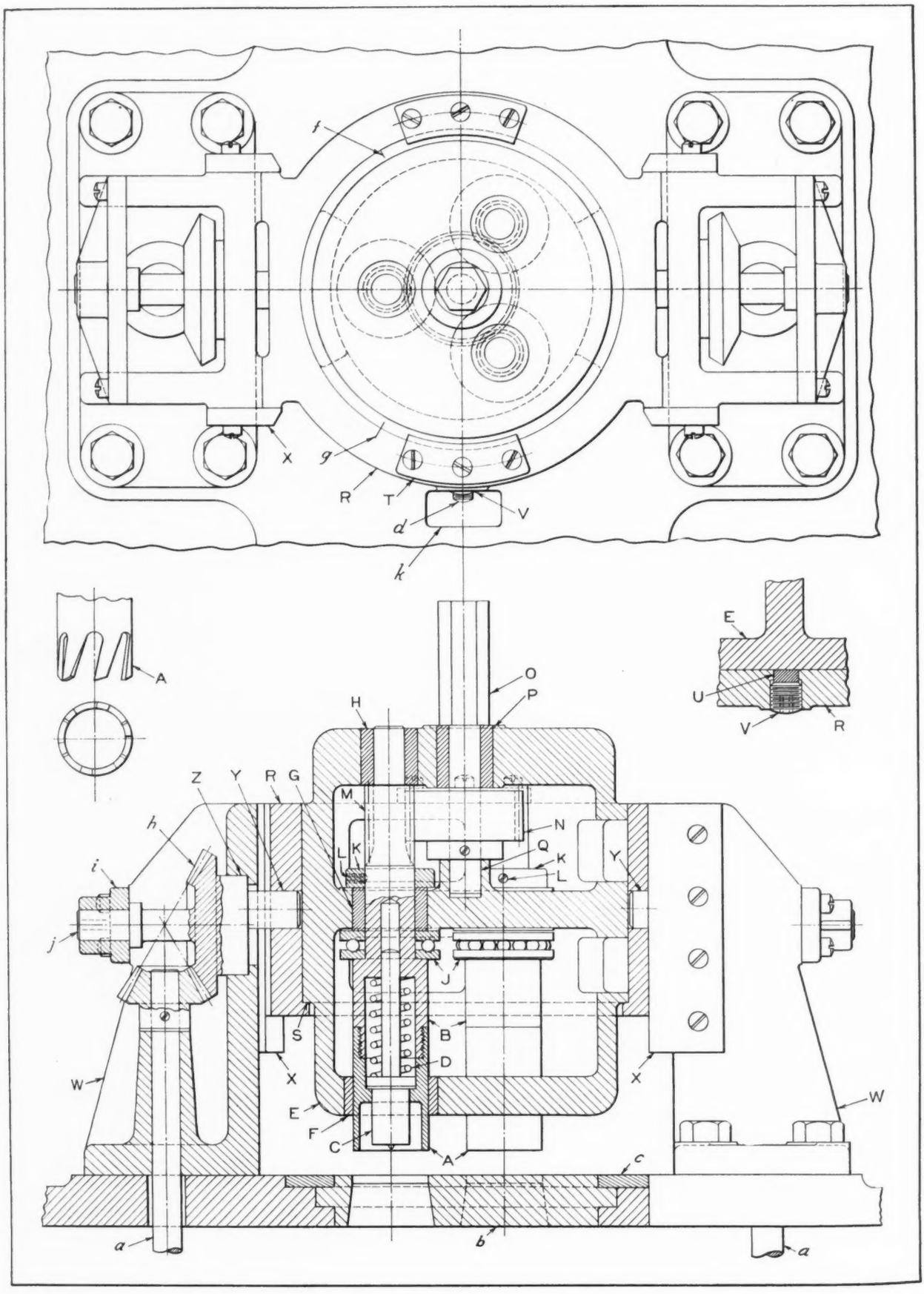


Fig. 1. Three-spindle End-milling Device with Automatic Feed and Provision for Changing Positions of Spindles to Mill Holes in Strip Stock According to Arrangements Shown in Fig. 3

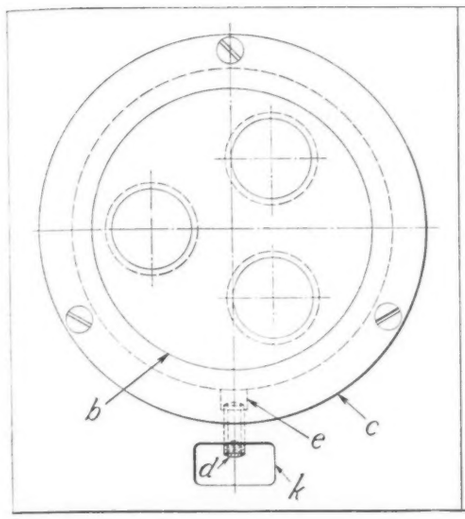


Fig. 2. Diagrammatic View of Plate b, Fig. 1

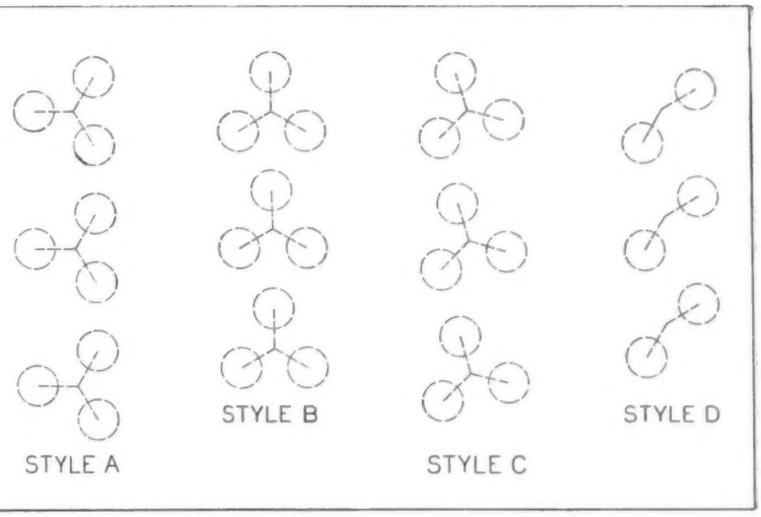


Fig. 3. Diagram Showing Some of the Different Arrangements of Holes Milled with the Device Shown in Fig. 1

product. Usually the cost of such a tool is not an important factor, the primary object being to keep the number of tools as small as possible, as in the case of the device shown in Fig. 1.

This device was developed to mill three holes simultaneously in long pieces of sheet material. After milling three holes, the material is fed along, or indexed into position for milling another group of three holes, by an intermittent mechanism controlled by the milling equipment. This intermittent feeding and milling is continued until the whole strip of material has been perforated. The arrangement of the holes varied, as shown in Fig. 3, where four of the innumerable combinations are indicated as Styles *A*, *B*, *C* and *D*.

The three holes forming a group are connected by dotted lines in the diagrams for Styles *A*, *B*, and *C* in Fig. 3 to show more clearly the method of milling. Style *B* is obtained by rotating the entire group through an angle of 30 degrees from the position indicated as Style *A*. Style *C* is obtained by rotating the group 45 degrees in the same direction from the position indicated as Style *A*. Style *D* is an arrangement obtained by removing one of the milling cutters. The spacing between successive groups of holes can be varied by adjusting the stroke of the sheet-feeding mechanism.

The milling cutters or trepanning tools, shown in cross-section and diagrammatically at *A* in the assembly view, Fig. 1, were designed to permit salvaging the blank centerpiece produced in milling each hole. These cutters are made with trepanning teeth, as indicated in the detail view to the left, Fig. 1. They are, therefore, multi-operation tools, which serve to mill the holes in the sheet material in any group formation of three holes, and at the same time, permit a reduction in the waste material by allowing the center blanks to be cut to the required size.

The milling cutters are made in two parts, the tooth cutting member *A* and shaft *B*. These two members are assembled by means of a screw thread. This arrangement permits renewing or changing cutters of different dimensions to suit requirements. The spring-loaded ejector consists of the plunger *C* and the spring *D*. A sharp point at the end of the plunger *C* serves to mark the center of the blank disk as required for further manufacturing operations. The three milling cutters are assembled in a carrying head *E* provided with bushings *F*, *G*, and *H*. A thrust bearing *J* is also assembled with each cutter.

The collar *K*, clamped in place by set-screw *L*, holds the entire milling cutter assembly in place in the carrying head. The gear teeth *M*, cut in each shaft, mesh with teeth in the driving gear *N*, which is fastened to the drive-shaft *O*. Bearings are provided for the drive-shaft at *P* and *Q* to insure rigid support and accurate alignment. The upper hexagonal end of the drive-shaft is a sliding fit in a hexagonal hole in the driving member (not shown).

The yoke *R* supports head *E*, permitting it to be easily rotated to any desired position. The carrying head rests on a shoulder *S* and is secured by retainers *T*, fastened to the yoke *R*. The carrying head is locked in the yoke by the screw *V* and a plug *U*. The plug is machined to fit the side of the carrying head, so that it will not mar the surface when forced against it.

The machined surfaces on the two members *W* at each side of the yoke *R* permit a vertical reciprocating motion of the yoke. Strips *X* guide the yoke and maintain proper alignment. The reciprocating motion is imparted through the action of crankpins *Y* which work in slots cut in the yoke *R*. The crankpin is attached to the disk *Z* in the supporting member *W*.

The bevel gear *h* is an integral part of the crank disk *Z* and its shaft. A bearing block *i* fastened to the supporting members *W* is provided to retain the shaft *j*. A driving bevel pinion *a* fastened to the vertical drive-shaft rotates in a long bearing which is a part of the supporting member. The crankpins *Y* can be adjusted in their respective

slots in the yoke *R* so that the whole reciprocating mechanism can be accurately aligned. The two shafts *a* are driven from the same source, so that the pins *Y* move in unison and act together in transmitting the reciprocating or feeding movement to the cutter-carrying head.

The bottom plate *b* in the bed of the machine is provided with holes positioned to correspond with the three milling cutters in the carrying head *E*. These holes are just large enough at the top to permit the cutters *A* to pass through, and are tapered to provide clearance at the bottom.

A ring *c* serves to retain the bottom plate *b* in the machine bed. A locking arrangement similar to that used for locking the carrying head is provided for the bottom plate. A screw *d* and a plug *e*, Fig. 2, lock the bottom plate in position. An opening *k* in the bed plate provides access to the screw and does not interfere with the movement of the material on the surface.

In setting the machine for operation, the plate *b* is released and the carrying head is lowered so that the cutters enter their respective clearance holes in plate *b*. The carrying head is then released and rotated to the proper angle or position for milling the holes in the desired arrangement. The locking screws *V* and *d* are next tightened. In order to facilitate adjustment or resetting of the carrying head, the standard or accepted positions were marked on the carrying head. Any of these marks could then be set to register with a mark on the yoke. Two of these marks are shown at *f* and *g* in the upper view, Fig. 1.

The rotational speed of the cutters and the speed of the reciprocating feed are set to suit the material being cut. With slight adjustment and a little experimenting, the device can be adapted for nearly all classes of material that can be cut by metal-working tools.

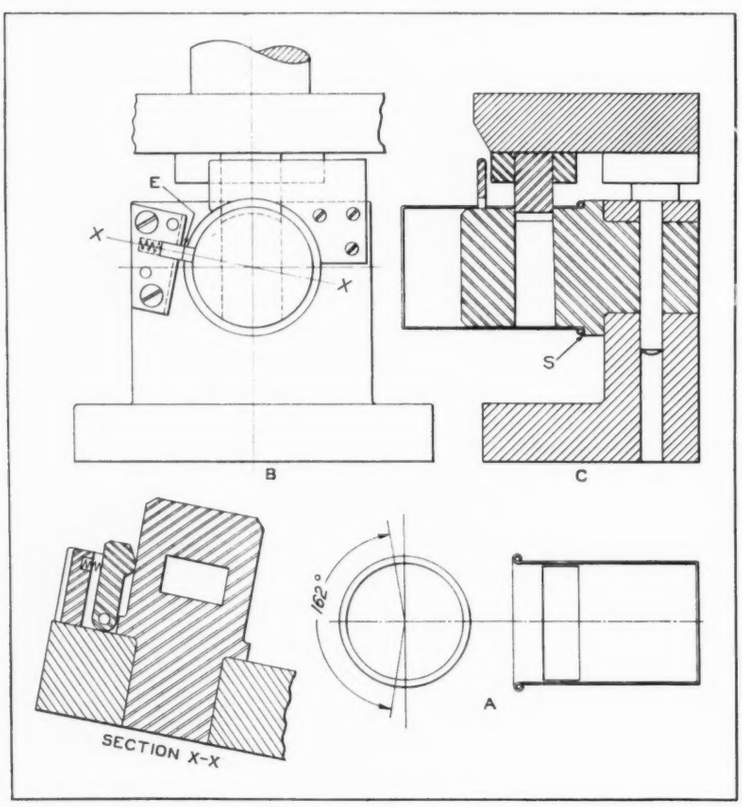
Die for Piercing an Elongated Hole in a Drawn Cup

By JOHN J. McHENRY, Detroit, Mich.

The elongated slot in the sheet-metal cup shown at *A* in the accompanying illustration is pierced by the horn type die shown in views *B* and *C*. The latch type gage *E* and the method of using it is the interesting feature of this die, the piercing punch being of ordinary construction, as clearly shown by the three views. In using the die, the operator pushes the cup over the die horn and against the shoulder *S*, as shown in view *C*. The press is then tripped, the trip-pedal being held down long enough for the crank to make three complete revolutions.

On the first descent of the press ram, a hole is pierced the size of the punch. As the ram ascends, the operator rotates the cup counter-clockwise until gage *E* comes in contact with the side of the pierced hole. On the second stroke of the ram, the punch pierces another hole the same size as the first, and as the ram ascends, the operator rotates the cup clockwise until the gage *E* comes in contact with the opposite side of the hole in which it is located, and again stops the rotation. On the third down stroke of the ram, the part of the shell remaining between the two pierced holes is removed, resulting in a hole of the required size.

The latch gage is held against the horn of the die by a coil spring, which permits the cups to be put in place or removed. The operator becomes accustomed to the action of this gage and rotates or indexes the work automatically without considering the independent strokes or cycles.



Die with Indexing Stop for Piercing Elongated Slot in Drawn Cup

* * *

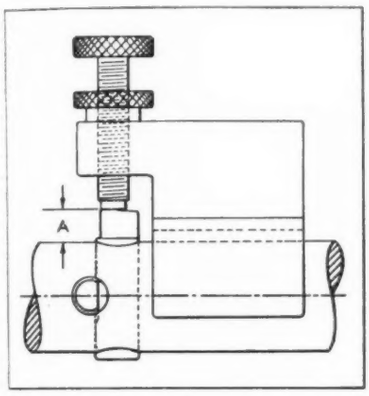
A 4500-pound gib and base casting of a 1500-ton toggle press for forging angle-bars and fish-plates was damaged —the base casting having fractured. It was repaired by bronze welding. The fracture occurred in July, 1931. Approximately five years later, the company using the press reported that the press had been in service ever since the bronze-welding repairs were completed, pressing out over 10,000 tons of steel annually, or an average of 35 tons a day. The repaired base casting is in every way as good as a new one.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Gage for Setting Boring-Bar Cutters

A V-block fitted with a knurled-head screw and clamping nut, as shown in the accompanying illustration, can be used to advantage in adjusting a boring-bar cutter to bore a hole of the desired diameter. The screw is first turned down until it touches the bar, and then turned back an amount equivalent to the distance *A* which the cutter is required to project beyond the bar. Twice this distance *A* plus the diameter of the bar gives the diameter of the hole bored. The distance *A* can be tested in one of several ways—either with calipers or a slip gage between the bar and screw, or with the jaws of a caliper square. It is not necessary to take trial cuts when this gage is employed.



Gage for Setting Boring-bar Cutters

F. H.

Vibration-Absorption Material in Machine Construction

There seems to be a growing tendency to set machines productive of vibration upon some sort of material that will absorb vibration. The purpose in doing this is not alone to curb vibration in the machine, though it does have a certain effect in that direction. The chief advantage and purpose is to isolate the machine, so that it cannot transmit vibration to the floor, and through the floor to other machines and equipment.

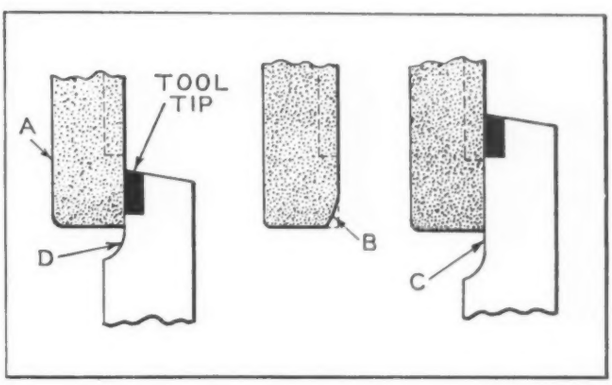
In some cases, material used for this purpose is made principally of cork, and in other cases, of course, rubber is used. The thought arises in this connection as to whether it would not be possible in some instances to fasten various sections of machines together with a pad of such material between the two parts. With such pads between sections, and with rubber washers keeping bolt heads and nuts from making metal-to-metal contact, the sections could be drawn up very tightly and yet would have a certain amount of vibration absorption.

Peoria, Ill. JOHN E. HYLER

Kink for Facilitating Free-Hand Grinding of Tungsten-Carbide Tools

When a carbide-tipped turning tool has become shortened on the end from successive resharpening, it becomes increasingly difficult to finish-grind the clearance angles with a diamond cup-shaped wheel, due to inability to pass the tungsten-carbide tip entirely across the face of the wheel before the shank shoulder at *D* hits the rim of the wheel *A*. Continuous grinding of the shortened tools will eventually result in wearing the diamond wheel to a convex form, as indicated at *B*, thus making useless the protractor furnished with modern carbide tool grinders.

This difficulty can be avoided, in making new tools, by milling the shoulders of the tool 1/2 inch farther back from the end than usual, as shown at *C*, thus permitting the entire tungsten-carbide tip to pass across the face of the wheel when being ground.



Diagrams Showing Methods Used in Grinding Tungsten-carbide Tools

Springfield, Mass. STANLEY M. WHITE

* * *

Despite an increase of 7000 employes during the year, the accident rate in the eighteen plants of the Westinghouse Electric & Mfg. Co. advanced only two-tenths of one per cent in 1937, according to Dr. T. Lyle Hazlett, medical director.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Designing Section Forming Rolls

E. W.—Flat mild-steel strip stock, 2 1/4 inches wide by 1/8 inch thick, is required to be formed to the shape indicated by the cross-section at *W* in the illustration Fig. 1. A seven-roll forming machine is available for this operation. Can you give us any information on the form of the rolls best suited for this particular job?

A.—In rolling strip stock to any desired shape, it is essential that it be well guided. This can be done by designing the first pair of rolls as shown in the first position, Fig. 1, the distance between the guide flanges of the top roll being equal to the width of the stock.

The second pair of rolls forms the double radii. At this stage, the strip does not need to be guided if the machine runs true. This applies also to the following rolls, as the form is sufficient to insure correct positioning. The third pair of rolls starts the upward and downward bending of the two side arms, the amount of movement being equal to the angle through which the arms must be formed to obtain the final position divided by the number of rolls remaining. In this case, $90 \div 5 = 18$ degrees.

Rolls 4, 5, 6, and 7 carry on the bending of the side arms until the final stage is reached. It is essential that the surface speed of all the rolls at points *D* be kept constant throughout, as this governs the travel of the stock through the machine. The rolls should also pinch the stock hard at these points.

J. S.

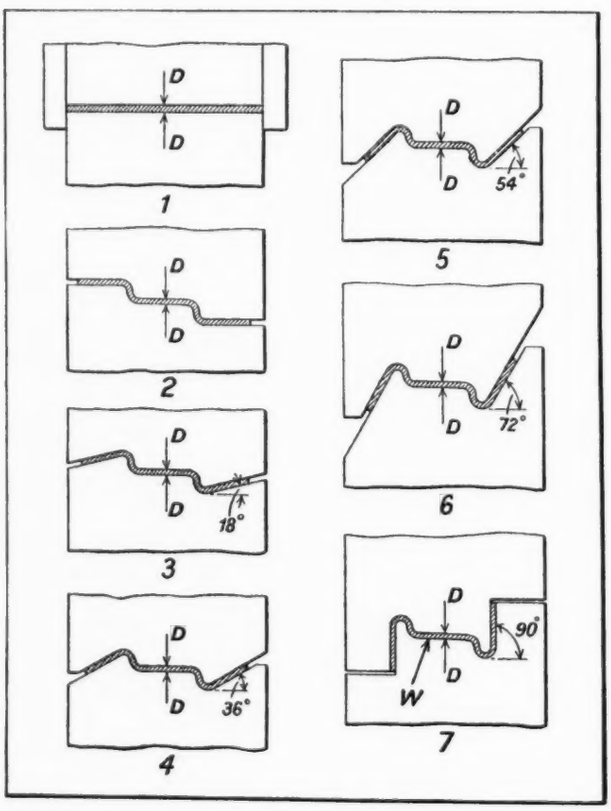


Fig. 1. Diagrams Showing Successive Steps in Rolling Section Shown at W

Answered by E. Stevan

In designing rolls for channelling or section forming, no sudden change of form should be attempted between any two sets of rolls. Easy progression of stages should be arranged, the final set so forming and compressing the section that the strip will emerge without having been distorted by pinching and stretching.

In using a channelling machine where the roll centers are fixed, or the top roll only has means for adjustment, the rolls must be designed so that they are approximately of equal diameter, and the form should be machined equally above and below the pitch line of the rolls, and also arranged directly in the center of the roll width. The strip will thus be fed forward from one station to another at the same level, and so will remain straight and rigid. A full set of rolls is illustrated in Fig. 2, showing the shapes required to form the section from the strip.

In making the templets for machining the rolls, considerable care must be exercised. The form of each section should be carefully drawn, opposite templets being made to suit each roll. Diameters and contours must be carefully checked. The rolls at the earlier stages may have the form ends left open, as at 2 and 3, but at the later stages, and especially for the final set, almost the whole form should be enveloped in the rolls, so that swaging and compressing of the material will take place and a true section will emerge.

Any distortion or pinching of the strip will cause the work to stretch or wrinkle, and it may not enter the rolls properly in the next station. The resulting cumulative errors will then give a poor section.

Hardening the rolls is difficult unless a high-grade steel is used and suitable facilities for the work are available. Large diameters with small radii, and relatively small diameters as opposed to large diameters next to them, will be subject to a great variation in contraction upon cooling and

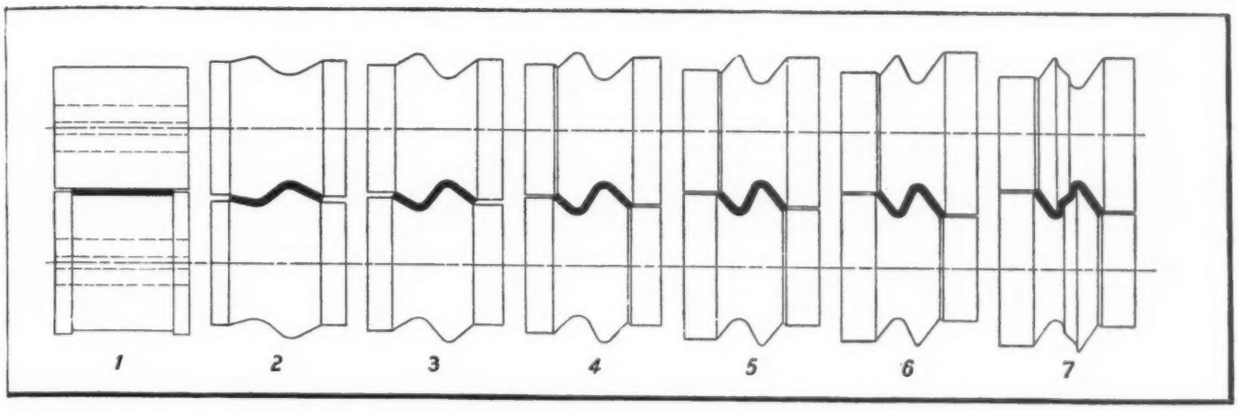


Fig. 2. Sequence of Rolls for Forming Section from Strip Material

may cause expensive rolls to crack in hardening. A casehardening mild steel, properly treated, is suitable for light materials or for small quantities, but where a relatively strong material is to be formed, or long trouble-free runs are desired, one of the specially recommended oil-hardening or air-hardening tool steels should be employed. Heating should be watched, as blistering or pitting will cause trouble at the crests of the ridges on the rolls. Any subsequent touching up is attended with danger of spoiling the rolls.

Trial runs after machining and polishing should be made to see if any tight spots need "easing." After being checked in this way, the rolls should be numbered and marked as to their respective stages and positions before they are hardened.

Oilstoning and emery-polishing may be necessary before use, and in case of distortion after hardening, adjustment may be required, when very careful application of a shaped grinding wheel is the only possible means of correcting a fault.

When is a Salesman Liable for His Customer's Payments?

F. H.—When is a salesman or agent personally liable when his employer is unable to collect payment on equipment the salesman has sold?

Answered by Leo T. Parker, Attorney-at-Law
Cincinnati, Ohio

The salesman, of course, is personally liable if he guarantees the account. Moreover, various courts have held that a representative must exercise ordinary care, skill, and diligence in the performance of all his duties, and that he will be held liable to his employer for any loss that his negligence may occasion. Also, a sub-agent, appointed by the representative, is liable for all losses suffered by the employer as a result of the sub-agent's negligence; and the representative is personally liable for the sub-agent's negligence, as well as his own.

Another important point of the law is that where an agent has mere authority to sell, he does not have the authority to sell on credit; nor does an agent for collection have authority to accept anything but cash without express authority, or to do anything unusual which would jeopardize the rights of the creditor or the liability of the debtor.

For illustration, in Ott vs. Schneiter [10 N. E. (2d) 947], a salesman represented a company. This salesman ordered, for a customer, a carload of goods from his company, drew a bill of lading for the car, and procured a draft for the payment of the goods. He was instructed by his company to send a sight draft for the purchase price of the merchandise, and he did so. However, without authority from his company, he authorized the bank that had prepared the draft to release the bill of lading and the draft. The bank did so, solely on the authority of the salesman; it did not receive any authorization from his company.

The purchaser failed to pay the amount due on the goods, the result being that the company selling the goods suffered a financial loss of $3763, the value of the car of goods. The company filed suit against the salesman and the bank for the loss.

In holding the company entitled to recovery, the Court said: "There is no testimony in the record showing that the salesman was instructed by the appellee (seller) to release the sight draft. . . . The law is clearly established that a sub-agent (bank) who negligently performs his duties, thus injuring the rights of the principal, is liable to the principal to the extent of the injury suffered by him."

* * *

It was not so many years ago that cast iron was listed in various tables and engineering handbooks as a material having a tensile strength of from 15,000 to 20,000 pounds per square inch. Basing their calculations on these figures, engineers were obliged to design heavy, cumbersome equipment, which, because of its weight, resulted in low efficiency and limited applications. Today, specifications calling for tensile strengths of from 50,000 to 60,000 pounds per square inch are common, while several progressive foundries are producing machineable gray iron of even higher strengths. —*A. G. Zima, of the International Nickel Co.*

What a Machine Designer Should Know About Motors

Some of the Characteristics of Different Types of Motors, and Some Fundamental Principles Governing the Choice of the Right Motor for a Certain Application

By J. R. NORLING, Industrial Division
Westinghouse Electric & Mfg. Co.

IN applying a motor, it is necessary to analyze the load requirements carefully and accurately before choosing the type and size. The following factors may prove helpful in making the right selection.

A direct-current distribution circuit is identified by its voltage only. An alternating-current circuit is described by its phase, frequency, and voltage. Large power companies generally use three-phase, 60-cycle circuits for power applications, and single-phase 60-cycle circuits for lighting purposes. The common voltages are 220 and 440 volts for power, and 110 and 220 volts for lighting. Bear in mind, however, that there are several companies supplying odd frequencies, such as 50, 40, and 25 cycles, and still others using a two-phase, four-wire service. Also, in some localities the voltage is 115 and 208 volts.

In localities served by direct-current service, 230 volts is considered standard for power applications and 115 volts for lighting applications. While 550 volts is commonly used for street railway systems, this voltage is fast losing favor industrially, due to its hazard to employes. Excessive cost of wiring and controllers prohibits the use of 115-volt motors, except in small sizes.

Motors will operate satisfactorily on voltages 10 per cent above or below the figures given. However, increased or decreased voltage gives rise to certain disadvantages. When the voltage is increased beyond the motor rating, the torque or pull of the motor increases and the motor losses are greater. These losses are serious when the voltage is increased more than 10 per cent. Also, in the case of alternating-current motors, increased voltage reduces the motor power factor.

Decreased voltage not only reduces the speed of the motor, but also decreases the pull-out torque of an induction motor in proportion to the square of the applied voltage. As an example, a motor operating on 90 per cent of the nameplate voltage, develops only 81 per cent of its normal torque.

The capacity of the line feeding the motor is responsible at times for decreased voltage at the motor terminals. Therefore, it is necessary that the circuit be of sufficient capacity to maintain close to nameplate voltage for starting and for overload.

Motors are commonly connected to machines either directly, through belts, by gears, or by chains. It is advisable to use a direct connection wherever possible, in view of the increased efficiency obtained. In the case of high-speed units particularly, direct connection is simple and inexpensive, and also reduces the floor space required. With slower speeds, direct connection is sometimes prohibitive, on account of increased costs, due to the increased frame size of the motor required for equivalent horsepower rating.

Belts, chains, and gears are suitable for shunt and compound direct-current motors, as well as for polyphase motors, single-phase repulsion-induction motors, and split-phase motors.

Series motors, such as are commonly used on cranes, should be direct-connected or connected through gears, because any condition that will allow the motor to lose its load will permit it to rotate beyond the safe centrifugal limit for the armature winding and commutator, thereby causing its destruction.

Constant-speed motors are used on

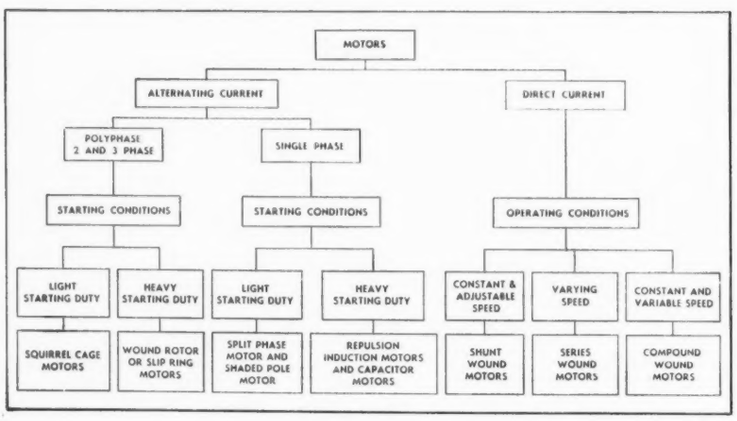


Diagram Showing Types of Motors and Their Application

lineshaft applications, since the ratio of pulley sizes on the shaft and machine can be chosen to give the required speed. Constant-, variable-, and adjustable-speed motors are all applicable to individual drives, the type chosen depending on the application.

It is advisable to consider individual drive, as a motor shut-down affects only one machine, and in most instances, the fact that other machines are unaffected is of great advantage. Also, this type of drive allows the machines to be moved easily, without changing lineshafting.

When High Starting Torque is Needed

Machines starting under load, such as pumps, compressors, and heavily loaded machines, require motors capable of developing a high starting torque. This torque characteristic is expressed as a percentage of the full-load torque, and is considerably higher than the torque required for continued operation. On single-phase circuits, a repulsion-induction, high-torque split-phase, or capacitor motor is used. On polyphase circuits, a high-torque squirrel-cage or a wound-rotor motor is used. When starting currents are limited, either a double squirrel-cage or wound-rotor motor is necessary. The wound-rotor type produces the greatest starting torque at the lowest starting current.

All direct-current motors have a high pull-out torque characteristic. This characteristic is the same as maximum or breakdown torque, and is also specified as a percentage of the full-load torque. Since this characteristic need be considered only in the case of alternating-current motors, and since applications necessitating its consideration are quite technical, it is best to have the application reviewed by the motor manufacturer's engineers.

Operating Cycle and Peak Loads

Some applications require a motor for continuous operation, while others require equipment suitable for intermittent duty only. In cases where a motor is to be operated for a period of fifteen, thirty, or sixty minutes, and is then allowed to rest for a similar period, an intermittent-duty motor may be used. Machines that operate for periods longer than an hour require continuously rated motors.

Motors are designed to care for momentary peak loads without injury. When a motor is called upon to carry a sustained overload, as might be the case with a motor driving a generator, it is necessary that this peak be well within the overload capacity of the machine. Motors now have a service factor of 15 per cent, which means that a sustained overload of 15 per cent beyond the nameplate horsepower rating can be carried without injury. This service factor, however, applies only to open type motors with a temperature rating of 40 degrees C., continuous.

On machines involving flywheels, a squirrel-cage induction motor with a high-resistance, high-slip rotor is used. High-slip motors allow the flywheel to give up a part of its stored energy during, for example, a punching or shearing operation.

In selecting a motor for a flywheel application, it is necessary to know the WR^2 value of the flywheel. These letters express symbolically the inertia of the flywheel, W representing the weight in pounds, and R the radius from the center of the wheel to the imaginary concentration of the mass of the entire wheel. With this information, and the number of operations per minute of the machine, manufacturers' engineers can easily select the proper motor.

Mounting Characteristics of the Motor

Motors for horizontal mounting on the floor, wall, or ceiling can be of either ball or sleeve bearing construction. When a motor is mounted with its shaft vertical, ball bearings are required to care for the thrust produced by the weight of the rotor. Where there is additional thrust, thrust bearings must be incorporated.

On individual drives, several different forms of mounting can be employed for both horizontal and vertical applications. These forms are generally used by machinery manufacturers, but are seldom applied to existing installations. The popular types of mounting are ring-base mounting, flange mounting, and mounting by means of a machined rear-end bracket. These mountings give a highly efficient connection, decrease the size of the complete unit, and improve the appearance.

How Location of Motor Influences its Selection

Atmospheric conditions often govern the choice of a motor. When a motor is to be used in an atmosphere containing considerable moisture, or when it is to be subjected to acid fumes or salt air, the windings must be specially impregnated. This is particularly true in the case of chemical plant and dye-house installations. When a motor is to be subjected to splashing or dripping water, as in the case of brewery and dairy applications, splash-proof motors are used.

In hazardous locations, where the air contains inflammable dust or vapor, specially constructed explosion-resisting motors are used. In some dusty atmospheres, where the dust is not excessive, standard open squirrel-cage motors are used, since the motor has no brushes to cause sparking. The underwriters' regulations govern these applications quite rigidly, and it is therefore advisable to obtain recommendations from the motor manufacturers.

Ordinary motors can be made dust-resisting, but the restriction of ventilation reduces the capacity of the motor and increases its operating temperature. These conditions may cause a change in rating from continuous to intermittent operation.

Sometimes there is considerable lint in the at-

mosphere, as in textile plants, jute mills, and wool-pulling establishments. In cases of this kind, either a screened motor or a lint-free motor is used. Unless a screened motor is maintained properly and the lint is removed from the screens frequently, overheating will result, due to restricted ventilation. Lint-free motors cause no trouble on this score, since the windings are specially treated to allow the lint to pass through the motor.

Single-Phase Motors and Their Application

Single-phase motors are commonly divided into four types—split-phase, repulsion-induction, capacitor, and shaded-pole.

General-purpose split-phase motors start with a high-resistance auxiliary winding in the circuit, which is cut out at approximately 80 per cent of full-load speed by a centrifugal switch. These motors have medium starting torque with starting current of 20 amperes or less, and are used on such applications as oil burners, fans, blowers, centrifugal pumps, and small woodworking machines. High-torque split-phase motors are similar, except that they have a higher starting torque and a higher starting current. Applications include washing machines, ironing machines, and similar uses, where higher starting torque is required and starting current in excess of 20 amperes is permissible.

General-purpose repulsion-induction motors start as repulsion motors and run as induction motors. A slug type short-circuiter short-circuits the commutator bars at approximately 80 per cent of full-load speed. These motors have high starting torque with low starting current. Applications include plunger pumps, compressors, machine tools, and general use.

General-purpose capacitor motors start with a high capacitance in an auxiliary winding, which is cut out at approximately 80 per cent of full-load speed by a centrifugal switch. These motors have high starting and very high pull-in torques. Applications include stokers, pumps, and compressors.

Shaded-pole motors are inherently the simplest type of motor, since no starting switch is required. The starting torque is obtained by a short-circuited low-resistance winding around a part of the field poles. These motors have low starting torque and very high slip. Applications include fans, blowers, heaters, valves, and similar industrial uses.

Universal motors can be operated on either alternating or direct current, although the characteristics are different on each service. It is sometimes necessary to insert resistance in the motor circuit in order to obtain the correct speed. Since the motor has a series characteristic, the speed decreases rapidly with increased load. Applications include small hand tools, pumps, and calculators.

Polyphase motors are divided into two types, squirrel-cage and wound-rotor. General-purpose squirrel-cage motors have normal starting torque and normal starting current. Linestart Class I motors have low starting current and normal starting torque. Linestart Class II or double squirrel-cage motors have low starting current and high starting torque. Applications for these three types are numerous, and embrace practically every machinery application involving a constant-speed motor.

Wound-rotor motors, when used with an external resistance in the rotor circuit, develop high starting torque with low starting current. These motors can be operated at constant speed or the speed can be varied on changing the value of the external resistance. The applications include those in which constant speed is wanted, but with high torque at very low starting current; also, equipment requiring varying speed, such as fans, blowers, hoists, and conveyors.

Direct-Current Motors

The operating characteristics of direct-current motors are determined principally by the type of field winding employed. The following is a brief comparison of the shunt, compound, and series-wound types.

Shunt-wound motors, when placed directly on the line, draw several times the full-load current and develop approximately two or three times the full-load torque. A starting rheostat limits the starting current to approximately twice the full-load current on the first resistance step. The torque developed is directly proportional to the starting current. Rheostats are used on ratings of 1/2 horsepower and larger, and on smaller ratings if starting is frequent. The operating speed is practically constant over the entire load range.

Compound-wound motors develop higher starting and maximum torques with the same current input than the shunt-wound type. However, the operating speed varies more widely with change in load. These motors are used on applications where a high starting torque is desired and where a change of speed with change of load is not objectionable. On applications involving frequent starting, although high torque is not desired, compound-wound motors should be used.

A series motor on a given current input develops higher starting and maximum torques than the shunt- or compound-wound type. The speed varies widely with change in load, and reaches dangerous limits when the motor is lightly loaded. Series motors should be directly connected or applied through gears, and should be used on those applications where a very high torque, either in starting or operating, is required, provided varying speed with varying load is not objectionable. Applications cover propeller type fans, valves, cranes, hoists, and shop trucks.

* * *

You cannot build a 1938 product at 1938 costs and with 1938 quality by using 1928 equipment and methods.

Spectacular Motion Pictures Portray Steel-Making

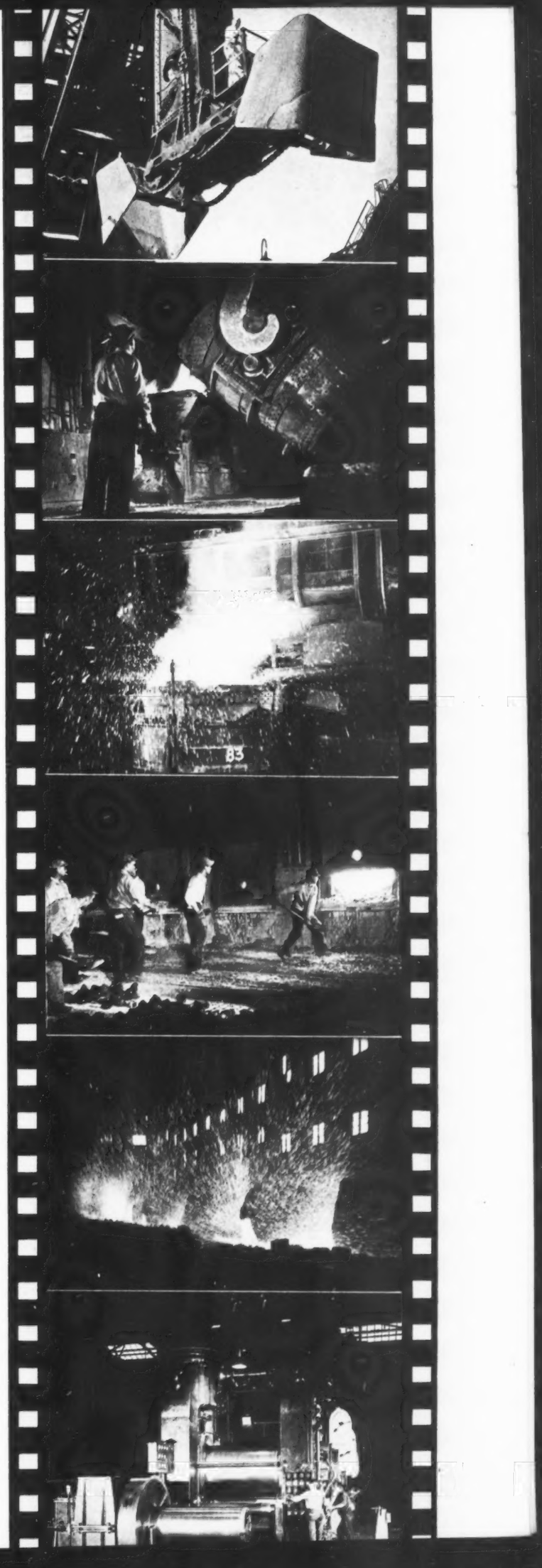
TECHNICOLOR and sound have been used to excellent advantage in the production of two industrial motion pictures recently filmed on the properties of various subsidiaries of the United States Steel Corporation. Technicolor has made possible a realistic presentation of the spectacular phases of steel-making. Natural hues of open-pit ore mines, lake water, and sky are faithfully portrayed. Vivid reds and yellows flash from Bessemer converters and illuminate open-hearth charging floors. Soaking pits radiate a yellow-white light, while touches of bright orange-red are produced by rows of newly shaped ingots.

One of the films, entitled "Steel—Man's Servant," comprises four reels and gives a comprehensive picture of steel-making, beginning with the digging of iron ore in pit and underground mines and its transportation over the Great Lakes on ore boats. Huge Hulett unloaders are seen removing the ore from these steamers and storing it on mammoth piles, after which the fascinating work performed at blast furnaces, open-hearth furnaces, Bessemer converters and electric furnaces is shown. The portion of the film that follows, which is particularly instructive, shows the casting of ingots and rolling of slabs into sheets, plates, rails, and I-beams, as well as the production of seamless steel tubing, the drawing of wire, the pressing of large car-wheels, and the forging of heavy axles.

The film ends with a series of views that emphasize the indispensability of steel in the civilization of today. Its aim throughout is to show the great amount of industrial activity necessary before it is possible to start the production of automobiles, the construction of great buildings, ships, or bridges, and the manufacture of an endless variety of steel products, ranging from tacks or cooking utensils to streamline trains. A shorter one-reel film, called "Men Make Steel," presents the high-lights of the longer film.

Throughout both films, the operations of steel-making are explained in an instructing and entertaining manner by Edwin C. Hill, and a musical score recorded by an orchestra of thirty-five musicians provides a continuous background of sound. The films were made with the same technique as is employed in making a Hollywood feature production. It took a crew of twenty-one photographers, technicians, and electricians ten weeks to complete the work.

A special railroad car transported the crew and equipment to each location; included in the equipment was a motor-generator powerful enough to illuminate a city of 15,000 homes, which supplied current for the flood lights. Platforms suspended from overhead cranes carried the photographers and lighting equipment close to furnaces, traveling ladles, rolling mills, and so on.



The Machine Tool Exhibition at the Leipzig Fair

By ERIK OBERG, Editor, MACHINERY

At the great engineering exhibition held annually in March, as part of the Leipzig Fair, the machine tool exhibits occupy one of the largest buildings. The total area of the engineering exhibition grounds covers approximately 100 acres, the nineteen exhibition buildings occupying more than one-third of this area, or about 35 acres.

The main building devoted to machine tools has a floor area of 175,000 square feet, most of the exhibition space being on the ground floor. The building is approximately 300 feet wide by 550 feet long. This year an additional building, having an area of 50,000 square feet, was devoted to machine tool exhibits. Plans are under way to enlarge the main building for next year's exhibition, so that all the machine tools can be housed in a single building.

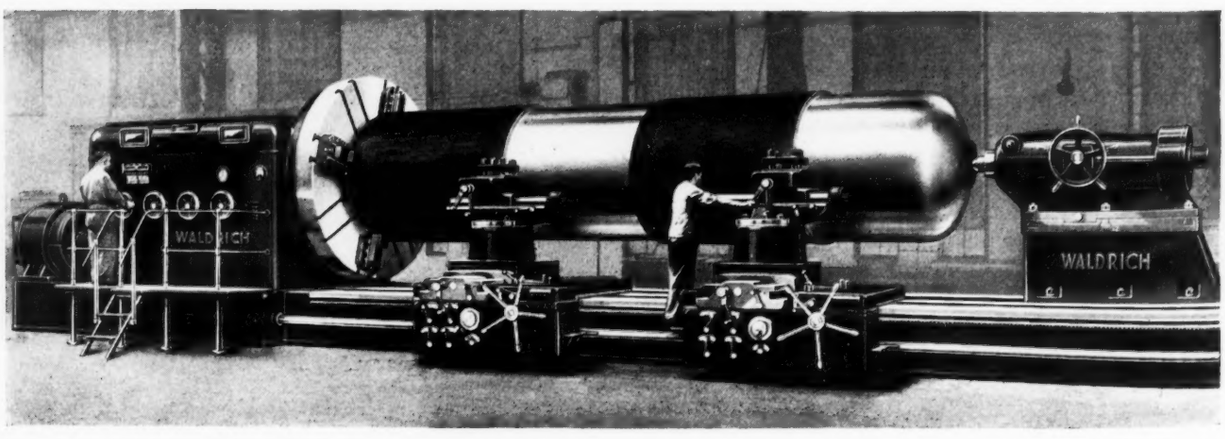
The entire number of exhibitors in the engineering exhibits was 3300, of which between 400 and 500 exhibited machine tools and accessories. One building of 64,000 square feet was devoted entirely to materials, most of which were of direct interest in the machine-building industries. A separate exhibition hall accommodated welding and flame-cutting equipment. To give an idea of the immense proportions of this engineering exposition, it may be mentioned that, in order to pass all the exhibition booths in all the buildings, it would be necessary to walk fifteen miles.

At the machine tool exhibition, the majority of the machines shown were not of entirely new design. Most of the machines had been exhibited at previous Leipzig Fairs, although obviously, on many of these machines, marked improvements had been made. In addition, there were many newly designed machines shown for the first time, as well as machines so completely redesigned as to be practically new. The exhibition as a whole presented an array of highly modern machines, most of them of quite advanced design.

The majority of the machines exhibited were of what is generally known as standard types. Very few were of the single-purpose type. Instead, machines easily adapted for various kinds of work predominated. There is an obvious reason for this. The German machine tool industry in the past has not had the opportunity that the American machine tool builder has had, to supply equipment to plants building a single product exclusively, and hence single-purpose machines have not been in great demand. It is necessary that the machines should be capable of being changed over, without undue expense, from one size of work to another or from one operation to another.

Briefly, among the outstanding features may be mentioned the following: There was a greater number of very large machine tools than are ordinarily seen at American machine tool exhibits. Welded frames and beds were very much in evidence. Electric control was featured on a great many machines. Hydraulic control was used large-

A Giant Lathe Exhibited by Maschinenfabrik Waldrich. This Machine will Take Work 13 Feet in Diameter Over the Bed, or 11 Feet in Diameter Over the Carriages. The Distance between Centers is Over 26 Feet. Work up to 90 Tons in Weight can be Accommodated. The Weight of the Machine is 240 Tons



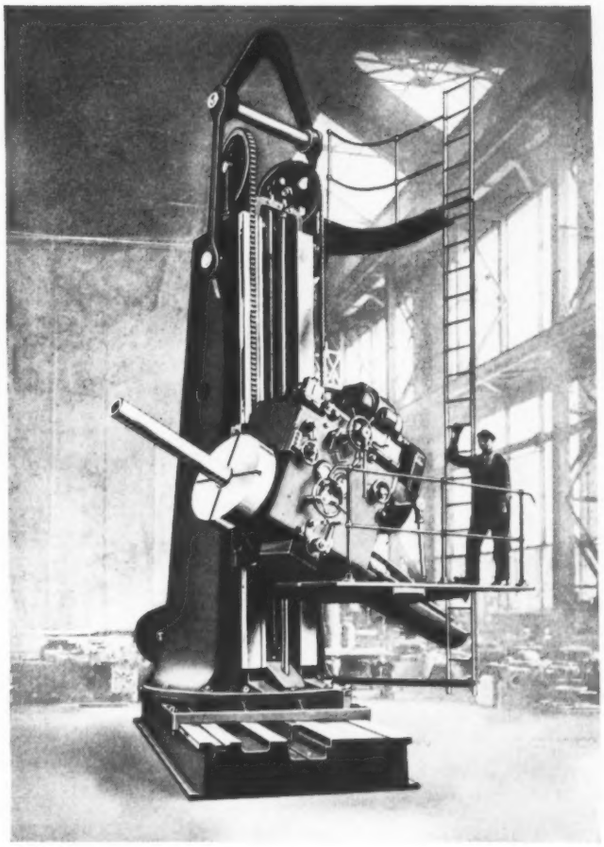
ly on grinding machines and shapers; but, on the whole, hydraulic operation was possibly less in evidence than in former years, there being a tendency, whenever possible, to employ electric rather than hydraulic control. Machine beds were quite generally ground, rather than scraped—that is, the ways of the bed were ground, but the sliding surfaces of the carriage moving along the bed were scraped. On high-precision machines, like grinding machines, sliding surfaces were generally scraped.

The electric control of machine tools has led to a much more general use of separate motors for spindle drives and feeds. The common method is to build the motor into the base or column of the machine. Flanged motors are used in comparatively few cases. Frequently the base or column also encloses the electric control equipment and automatic switches. For such operations as thread-cutting and turning close to shoulders, it was stated that it is possible to reverse electrically within a tolerance of approximately 0.001 inch. Reversible electric motors are used to an increasing extent; it was stated that in one case, the motor was reversed seven thousand times an hour.

Metal cold-sawing machines were frequently equipped with hydraulic feed, the saw having an infinite number of speeds, obtained by an oil motor or by a variable-speed drive. The Heynau variable-speed drive was incorporated in the design of a great many makes of machines.

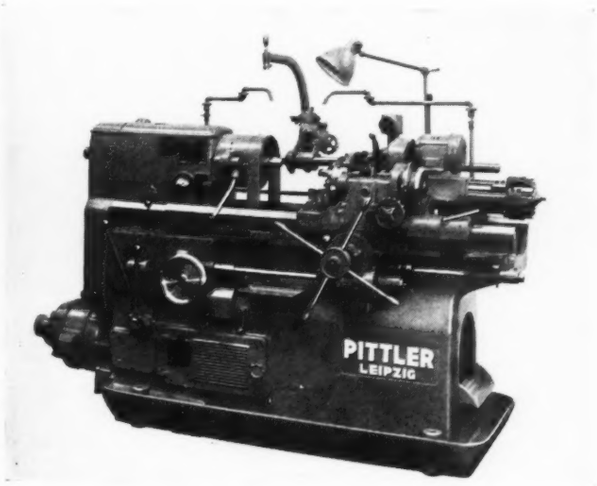
In the gear-cutting machine field, some new developments were shown. A gear-cutting machine for generating small bevel gears, such as are used in the instrument and small machinery field, created considerable interest. A single-purpose and a universal gear-lapping machine with new features were also exhibited. A spiral bevel-gear generating machine using a tapered hob was another feature of the exhibition.

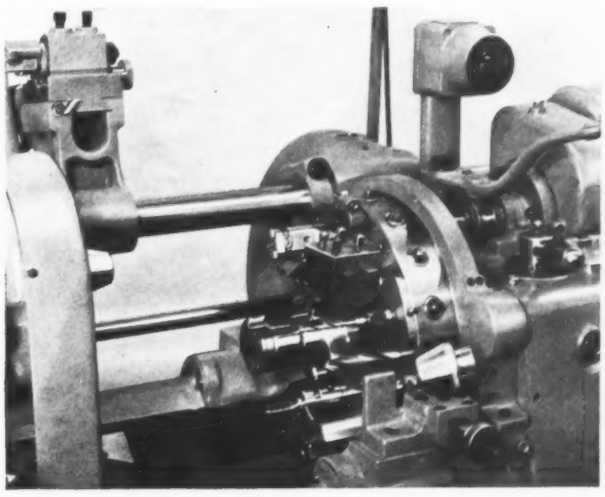
As mentioned previously, many of the machines were provided with welded frames and beds. The appearance of these welded frames was unusually good. For presses, shears, and similar machines, welded frames are, of course, no novelty; but in one instance, welded beds were used for grinding ma-

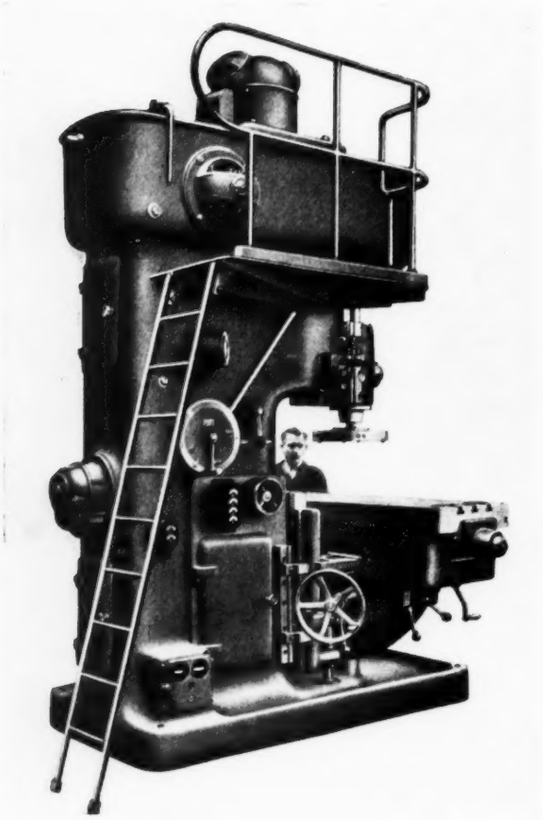


(Above) Many of the Machine Tools Exhibited were Unusually Large. This is a Schiess-Defries Horizontal Boring Machine Having an 8 1/2-inch Diameter Main Spindle. The Head can be Turned 30 Degrees Either Way of the Horizontal Position, and the Upright can be Turned through an Entire Circle

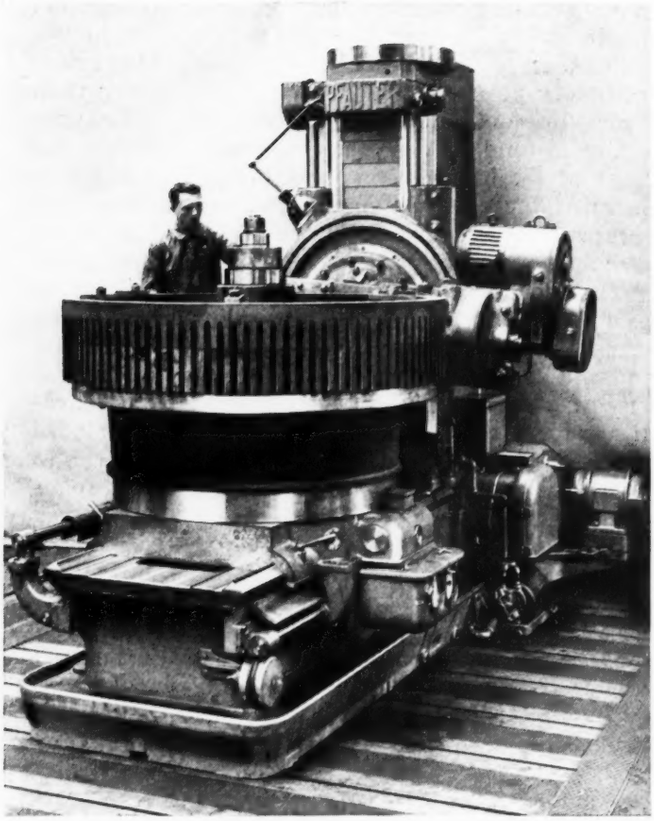
The Two Illustrations Below Show a Pittler High-speed Turret Lathe of Unusual Design. The Arrangement of the Turret and Tooling is Clearly Shown in the Close-up View to the Right



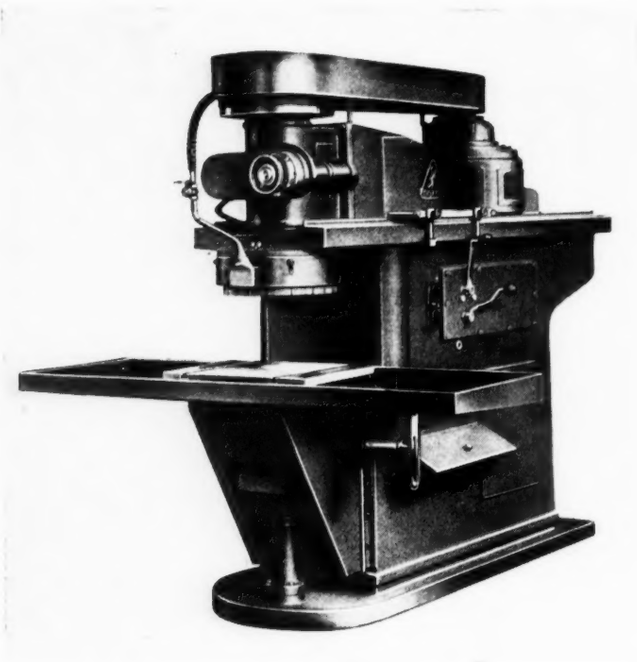




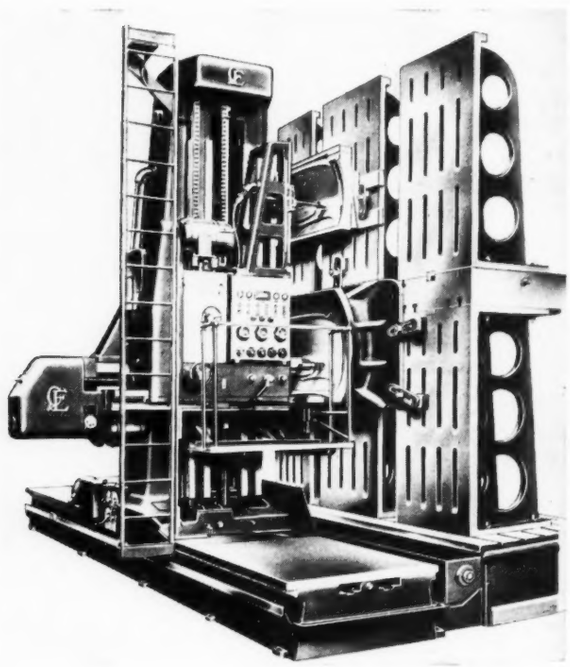
A Knee Type Milling Machine of Unusual Size and Design Exhibited by Mueller & Montag. Note that Upper Part of Machine is Reached by a Step Ladder



A New Pfauter Automatic Gear-hobbing Machine with Individual Motor for the Cutter-spindle. The Capacity of the Machine is for Gears up to 8 Feet 2 Inches in Diameter



An Example of All-welded Machine Tool Construction. This is a Surface Grinding Machine Built by the Diskus Werke



Large-capacity Electrically Controlled Automatic Die-making Machine Exhibited by Collet & Engelhard

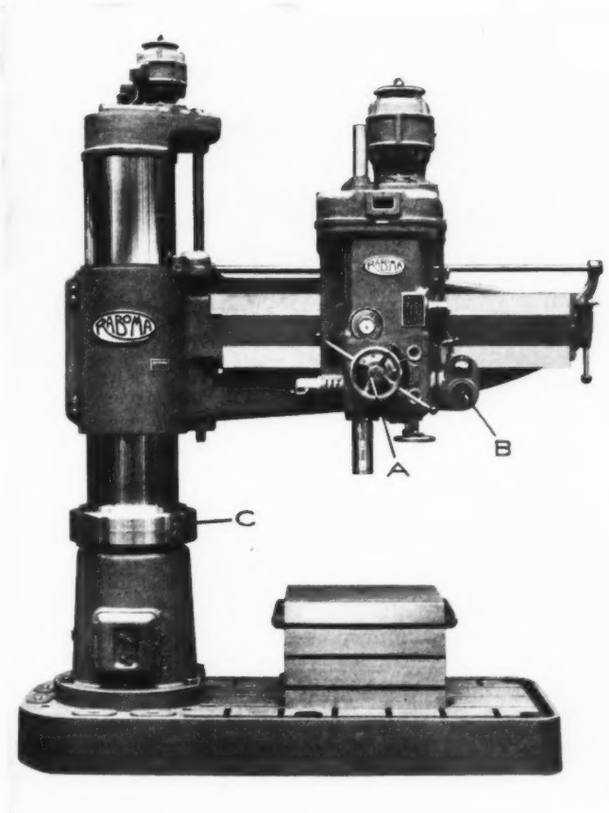
chines. In this case, it was claimed that by using thin welded steel plates, properly ribbed, it was possible to design a bed having only half the weight of a cast-iron bed, but the same rigidity and less vibration.

Referring to specific machines, it was noted that machines for thread-grinding, as well as those for gear-tooth grinding, were especially highly developed; so were machines for grinding hobs, cutters, and tools in a completely automatic operation. Hydraulic shapers in large sizes were exhibited by two manufacturers. Planer type milling machines are popular, and are built in comparatively small sizes. On the other hand, knee type milling machines were in evidence in unusually large sizes. Centerless grinding machines were exhibited by a number of German manufacturers. The Cincinnati Milling Machine Co. was the only American machine tool builder exhibiting at the Fair. This company exhibited its centerless grinding machines and milling machines.

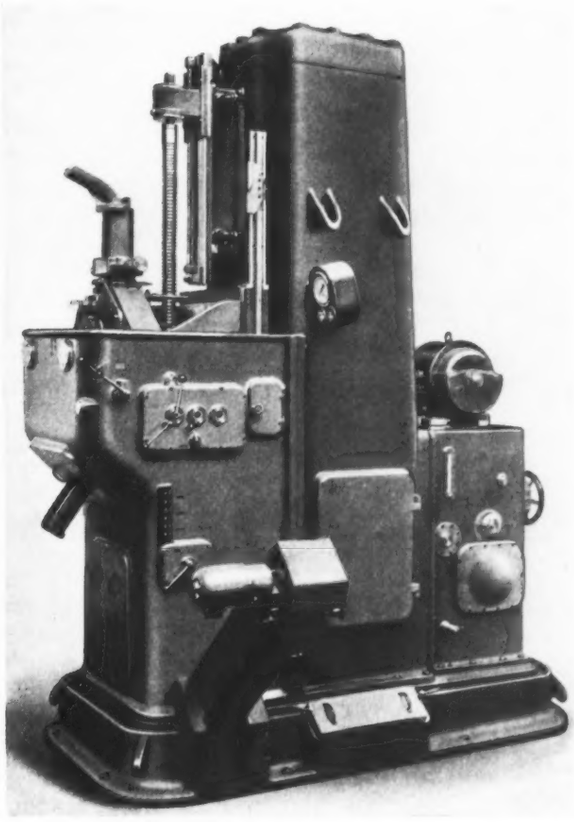
Die-sinking and engraving machines of the Keller type were exhibited by German makers, one of these machines being exceptionally large and heavy. A great many presses for sheet metal and plastics were exhibited. Several of the sheet-metal presses were shown in operation, provided with progressive dies having as many as ten stations, and automatic feeds. Generally speaking, they were of advanced design, with well proportioned welded frames.

Among minor details may be mentioned the great use made on German machine tools of chip and dust guards designed along the lines of folding bellows, for protection of columns and machine beds. In some instances, these bellows enclosed the entire column or ways, protecting them from grinding grit, chips, and dirt. An interesting device noted on a plate shear was a photo-electric cell safety device, so arranged that the machine would stop if the operator's hands were in a position where they might be injured, the hands interrupting the light beam from the electric eye. The sheet to be operated upon could pass through without interfering with the light beam; but a wider object would cause the device to operate.

The accompanying illustrations show a few of the machines at the Leipzig Fair and indicate in a general way the trend of German machine tool developments. Additional examples of modern German machine tool designs will be shown in June MACHINERY.



Typical Design of Raboma Radial Drilling Machine. Simultaneous Clamping of Saddle and Column is Effected by Electro-hydraulic Means through Push-buttons A. B is the Elevating Control. Pointers at C Indicate the Gradual Locking of the Column



Advanced Design of Broaching Machine Built by Alfred H. Schutte. This Machine has Push-button Control and is Hydraulically Operated. Modern Broaching Machines are Finding Increasingly Wider Application in German Industry

Gear Manufacturers Hold Annual Meeting at Niagara Falls

THE twenty-second annual meeting of the American Gear Manufacturers Association was held at the Hotel General Brock in Niagara Falls, Canada, April 25 to 27. As usual, the meeting was attended by a large representative group of the gear manufacturing industry. Reports of the technical standardization committees were presented. The Society's work in the standardization of gear design and manufacturing procedure continues to be one of its main endeavors.

The president of the Association, H. H. Kerr, president of the Boston Gear Works, in the opening address, outlined the current problems presented to industry in general and to the gear industry in particular.

During the meeting not less than twelve specially prepared papers and addresses were presented, the subjects and the authors of these being as follows: "Long-Time Program for the Business Enterprise," by F. H. Fowler, Foote Bros. Gear & Machine Co.; "University Training of Mechanical Engineers," by Professor Frank A. Mickle, University of Michigan; "Rates of Depreciation," by H. N. Mathias, Westinghouse Electric & Mfg. Co.; "Industrial Photography," by J. L. Boon, Eastman Kodak Co.; "Recent Durability Tests on Helical Gears," by George P. Maurer, The Falk Corporation; "Gear Sounds," by R. S. Drummond, National Broach & Machine Co.; "Couplings and Their Influence on Gear Operation," by W. P. Schmitter, The Falk Corporation; "Phenolic-Laminated Materials," by H. R. Moyer, Westinghouse Micarta Works; "Gear Welding—A Look Ahead," by H. S. Card, National Electrical Manufacturers Association; "Ball Bearing Design for Modern Heavy Duty," by Thomas Barish, Marlin Rockwell Corporation; "Silent Chain, Its Application to the Drive Problems of Industry," by J. M. Bryant, Link-Belt Co.; and "Gear Lubrication," by C. W. Bohmer, Jr., Standard Oil Co. of New Jersey.

Significance of National Foreign Trade Week

A SURVEY of current business, recently conducted by the National Foreign Trade Council, Inc., has revealed that, in the case of twelve major industries, as well as in many other lines of business, export trade has been the chief influence in taking up the slack during the current recession. In these outstanding cases, including such important industries as steel, heavy machinery, machine tools, motors and motor accessories, drugs, farm implements, petroleum products, refrigerators, radiators, canned and processed foods, business machines and typewriters, foreign trade has furnished employment to labor that would otherwise have been idle. In spite of the decline of domestic orders, factory costs have been kept down, domestic purchasing power has been sustained, and wages have been paid, largely because of increases in export trade; in 1937, these increases averaged 37 per cent over the exports of the previous year.

To show this fact more clearly and to widen the scope of information available to American industries engaged in foreign trade, National Foreign Trade Week is being observed in this country from May 22 to 28. In a thousand communities meetings will be held, moving pictures shown, addresses made, and radio comments broadcast in order to bring home to the general public how much this country depends for its present stability and well-being on its foreign trade.

Many industries realize what an important share of their business could come from abroad, but many others give it very little thought. The automobile industry, for example, is fully aware of the possibilities of foreign markets. Today, one out of every nine American automobiles goes to a foreign buyer. The machine tool industry, obviously, has always had a large proportion of foreign business.

The important thought that the National Foreign Trade Council wishes to emphasize in connection with National Foreign Trade Week is that domestic prosperity depends to a large extent upon exports, and more particularly, that we cannot sell unless we buy; we cannot export unless we import.

* * *

Dynamic Balance of Motors

In April MACHINERY, an article was published on "Adapting Alternating-Current Motors to Machine Tool Needs." It should be noted that, in the last paragraph concerning dynamic balance, according to the Westinghouse Electric & Mfg. Co., the method of test and limits given have been superseded. An NEMA standard states that such measurements should be made with the motor free to vibrate on an elastic mounting, which standard is followed by the Westinghouse company.

The Role of New England Industry in the Nation's Business

Abstract of an Address by Howard W. Dunbar, Vice-President, Norton Co., and President, National Machine Tool Builders' Association, before the American Management Association

MANY interesting facts relating to the past and present industrial activity of the New England states were brought out in an address delivered by H. W. Dunbar, vice-president of the Norton Co., Worcester, Mass., and president of the National Machine Tool Builders' Association, before the American Management Association in Boston, April 23. Mr. Dunbar pointed out how the six comparatively small states in the northeast corner of the country constitute America's oldest industrial pioneering field and emphasized how these states have been successful in meeting the industrial problems arising in later years. He called attention to the phrase "Yankee ingenuity," which has become a household expression, and added: "New England may not *now* boast of all the good mechanics in the United States, but there was a time when she so nearly held this position that the term 'New England mechanic' had a very definite meaning in the industrial world."

Nature endowed New England with few natural resources, but among these was water power. On the streams flowing from the New England hills sprang up numerous mills for the manufacture of all kinds of products. Real industrial development did not start until 1800, but once under way, its growth was rapid. In the short span of half a century, New England not only supplied the needs of this country, but began to export to Europe.

In the industrial development of New England there are two outstanding characteristics: First, the many small and medium-sized mills and factories scattered throughout the states, accounting for the diversity of the industries in which New England is engaged; and second, the skill and resourcefulness of New England mechanics in surmounting obstacles.

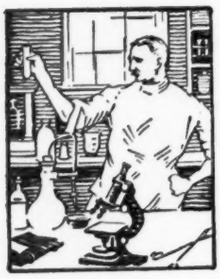
In these early little New England mills and factories were developed the machinery and the efficient organization of effort which laid the foundation for American industrial supremacy. Connecticut was the first state to manufacture brass and bronze products, silverware, firearms, watches, and clocks. Rhode Island, New Hampshire, and Massachusetts were the first states to engage in textile manufacture. New Hampshire and Massachusetts stand high in the shoe industry. Vermont rivals Italy in marble production. Massachusetts and Rhode Island still lead in improved textile machinery, and Massachusetts in the manufacture of shoe machinery. The northern New England states are leaders in the production of wood pulp and newsprint. New England once was the machine tool center of the United States, and the New England states are still of great importance in the manufacture of metal-working machinery. The world's largest artificial grinding wheel plant and grinding machine factory are located in Massachusetts. Connecticut boasts an important airplane plant, and precision tools are still a recognized product of New England.

"What of the present-day New England outlook?" asks Mr. Dunbar. "True, many of the industries have migrated southward and westward to be nearer the sources of raw materials and markets; but her factory production is so diversified that without textiles, boots and shoes, etc., New England would still enjoy fair prosperity. When factories move elsewhere, other industries are brought into the plants vacated."

An interesting observation can be made when reviewing the character of the businesses that have moved away from New England. An analysis shows that those that have gone are industries which are subject to violent fluctuations on the production chart, due to seasonal or intermittent demand. The character of the business remaining is more stable and less affected by temporary trends. The six states have well over two hundred different lines of manufacture, as listed in the Department of Commerce census tabulation.

In closing, Mr. Dunbar quoted a statement with which all forward-looking engineers and business men will agree: "The conviction grows that the great age of invention is not in the past, but in the future. We shall see many of the things we have dreamed of and some of which no man has yet dreamed. Development of these inventions will require many types of skill. We need dreamers to pull us out of the rut, and hard-headed business men to pull the dreamers back to earth. We need metallurgists and mathematicians. We need the old-style Yankee mechanics. We need economists —but not of the fake variety. We need men who can sell and distribute—stir up latent desires for the things some men can build and others can use. In fact, we need about everybody who can do something worth while that a machine cannot do."

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Zinc Alloys Greatly Improved in Last Sixteen Years

In a paper recently presented before the Western Metal Congress by W. W. Broughton of the New Jersey Zinc Co., it was pointed out that there is a vast difference in physical properties between the zinc alloys of today and those of sixteen years ago, when zinc die-castings were used almost entirely for ornamental purposes. While, in 1922, the properties of zinc alloys as cast made them suitable for many applications, the retention of both strength and size was not to be relied upon. Today these alloys can be used with the certainty that their properties will not alter in an unpredictable manner under various service conditions.

It is interesting to compare some of the physical properties of the former alloys with those of today. For example, the impact strength of three zinc alloys in 1922 was 1.0, 1.2, and 5.5 foot-pounds as cast, while the impact strength of three alloys at present is 18, 19, and 20 foot-pounds. The tensile strength of the same three former alloys was 24,900, 38,500, and 41,700 pounds per square inch as cast, compared with 45,400, 47,900, and 40,300 pounds per square inch for the present-day alloys. At the end of four years of indoor aging, the former alloys had a tensile strength of only 20,000, 17,700, and 24,800 pounds per square inch, while the present-day alloys have a tensile strength of 38,200, 49,200, and 34,600 pounds per square inch.....201

A New Material for Calking Crevices and Making Joints

A new plastic compound has been developed by the Maas & Waldstein Co., Newark, N. J., to take the place of putty and similar substances used for cementing glass to glass, metal, or wood, for calking crevices, and for making joints of various kinds. The new compound is known as "Plasticalk." It does not, like putty, dry, harden, crack, and shrink with age, but retains its plasticity and adhesiveness indefinitely. It is unaffected by water and humidity, and adheres strongly to the substances that it joins. This material has already found application in many industries; it is especially useful in the marine field, in the construction of refrigerated show-cases, etc. 202

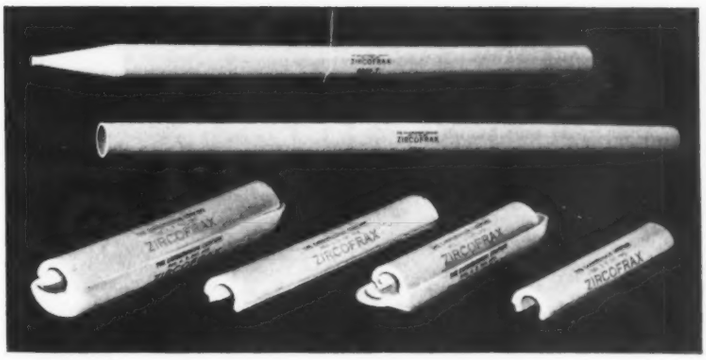
Thirty-nine Zinc Alloy Die-castings Used in the Construction of a New Rotary Duplicating Machine. These Zinc Die-castings Comprise 58 Per Cent of Total Weight of Machine

To obtain additional information about materials described on this page, see lower part of page 630.

"Zircofrax" Combustion Tubes, Boats, and Covers

After two years of research and development, coupled with cooperative tests in the laboratories of steel and alloy manufacturers, the Carborundum Co., Niagara Falls, N. Y., has placed on the market a line of "Zircofrax" combustion tubes, boats, and boat covers. These products are suitable for use at temperatures well above those required in the analysis of steels and alloys that melt at high temperatures. For example, the combustion boats and covers will withstand temperatures of 1450 degrees C. (2822 degrees F.), while the gas-tight tubes are vitrified above 1600 degrees C. (2912 degrees F.).

Plain tubes, and also tubes with one end tapered, are made in standard sizes from 7/8 inch to 1 3/8 inches inside diameter, while the boats are available in the normally required sizes. The raw material used in making these products is zirconium silicate. 203



"Zircofrax" Combustion Tubes and Boats for Use in Steel Analysis

Tantaloy Available in Bar Form for Cutting Tools

The inherent toughness of Tantaloy, the tantalum-carbide cutting metal made by the Fansteel Metallurgical Corporation, North Chicago, Ill., has led to a new method of making steel-cutting tools with tips from 1/16 to 1/8 inch in thickness. These thin tips are "flowed on" from bars of tantalum carbide by applying an acetylene torch after the shank of ordinary carbon steel has been recessed by milling or grinding. Tantaloy can be applied in the same manner to high-speed steel tools which have worn under size. After the tantalum carbide has been sweated on, the tool is ground.

Tantaloy metal, in bars 1/4 inch in diameter by 9 inches long, coated with Fanflux, is obtainable from the Michigan Tool Co., Detroit, Mich.; Illinois Tool Works, Chicago, Ill.; authorized Vascaloy-Ramet representatives; and direct from the manufacturer. Finished tools, milled and brazed tools, and square-end tools are also available through the same sources. 204

Aluminum Alloy Used for Funnels of New Mauretania

After a long period of experiments and tests, the builders of the new *Mauretania*, of the Cunard White Star Line, now under construction on the Merseyside in England, have decided to use aluminum alloy funnels for the ship. This will be the first time that a ship of this size has made use of aluminum funnels. The chief reason for the use of this material is the saving in weight, but an additional advantage is the non-corrosive properties of aluminum. 205

Eight Plaskon Pieces that Form the Housing of a New Toledo Scale. This Scale Weighs Only 58 Pounds as Compared with 160 Pounds for the Older Model which was Made of Castings

To obtain additional information about materials described on this page, see lower part of page 630.

NEW TRADE LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts and Materials. To Obtain Copies, Check on Form at Bottom of page 629 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in May Number of MACHINERY

Flexible Shafts

S. S. WHITE DENTAL MFG. CO., Industrial Division, 10 E. 40th St., New York City. Engineering Bulletin 38, on flexible shafts for remote controls. In addition to showing the various types of equipment made by the concern, this book contains considerable technical data, such as curves showing the relation between the load on the shaft and torsional deflection; information on shaft application procedure, methods of selecting the shaft, etc. 1

Cutting Oils

D. A. STUART OIL CO., 2729 S. Troy St., Chicago, Ill. Booklet entitled "The Story of Sulphurized Cutting Oils," comprising virtually a condensed textbook on machine tool lubrication. Among the subjects covered are cutting oil progress and research; types of sulphurized cutting oils; tests of cutting oils; when to use high or low added sulphur content in cutting fluids; and cutting oil application. 2

Drop-Forgings

DROP FORGING ASSOCIATION, 605 Hanna Bldg., Cleveland, Ohio. Circular entitled "Make Certain Your Equipment has an Ample Margin of Emergency Strength," showing a few of numerous instances where forgings have provided an ample margin of emergency strength, materially reduced power-consuming dead weight, and reduced machining and other production costs. 3

Laboratory Instruments

CLIMAX MOLYBDENUM CO., 500 Fifth Ave., New York City. The February number of the *Moly Matrix* contains an article describing a direct-reading metallurgical dilatometer for use in critical point determinations, coefficient of expansion measurements, growth tests, and similar studies concerning the relation between temperature and length changes of metals. 4

Grinding Machines

GARDNER MACHINE CO., 414 E. Gardner St., Beloit, Wis. Catalogue entitled "Modern Methods of Gardner-Grinding," containing illustrations of representative operations on Gardner disk grinders ranging from simple hand-operated machines and fixtures to high-production single-purpose machines. Production data is included in each case. 5

Electric Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y. "Instruments in Industry" is the title of a new house organ which will be issued periodically by the Meter Division of the General Electric Co. dealing with electric instruments and the benefits that they offer to industry for such work as testing, making plant surveys, controlling production, etc. 6

Electric Equipment

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Bulletin B-2113, describing the characteristics, advantages, and applications of Rectox rectifiers for changing alternating to direct current.

Booklet 43-600, on Westinghouse socket instruments for electric measuring in in-door and out-door service. 7

Lathes

ATLAS PRESS CO., Kalamazoo, Mich. Booklet entitled "On the Turns," illustrating typical operations performed on Atlas lathes in automotive service shops.

Booklet entitled "A Bench Lathe in the Electrical Department," illustrating the use of the Atlas bench lathe in automotive electrical departments. 8

Electrical Measuring Instruments

GENERAL ELECTRIC CO., Schenectady, N. Y. Bulletin GED-638, entitled "When You Can Measure," outlining the remarkable achievements made in accurate measurement, and describing how electrical measuring instruments are designed, constructed and tested. 9

Hydraulic Grinding Machines

CINCINNATI MILLING MACHINE AND CINCINNATI GRINDERS, INC., Cincinnati, Ohio. Catalogue G-410, illustrating and describing Cincinnati 6- and 10-inch plain hydraulic grinding machines, designed both for versatility and great productive power. 10

Precision Instruments

GAERTNER SCIENTIFIC CORPORATION, 1201 Wrightwood Ave., Chicago, Ill. Catalogue M-138, covering this company's line of precision instruments, including micrometer microscopes, measuring microscopes, test plates, telescopes and supports, comparators, dividing machines, etc. 11

Pneumatic and Hydraulic Power Units and Controls

PNEUMATIC MACHINERY CO., 525 W. 76th St., Chicago, Ill. Circular illustrating the pneumatic and hydraulic power units and controls made by this concern in a variety of standard types and sizes for machine tool and production machine needs. 12

Lubricants

E. F. HOUGHTON & CO., Third, American, and Somerset Sts., Philadelphia, Pa. Circular entitled "Making Dirty Oil Come Clean," describing the advantages of filtering oil in all forms of circulating systems, and showing various designs of oil filters for industrial use. 13

Presses

E. W. BLISS CO., 53rd St. and Second Ave., Brooklyn, N. Y. Booklet giving a general non-technical outline of the nature of the business, and showing views in the company's

five domestic and two foreign plants. Some of the many applications of Bliss presses are also shown. 14

Nickel Alloys

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City. Bulletin entitled "Six Minutes with Six Metals," containing information on the properties and applications of Monel, K Monel, R Monel, Inconel, nickel, and S Monel castings. 15

Flexible Shaft Machinery

R. G. HASKINS CO., 4634 W. Fulton St., Chicago, Ill. Bulletin entitled "The Haskins Method of Applying Screws and Nuts," showing the application of flexible shaft equipment in assembling various classes of work. 16

Speed Indicators

HERMAN H. STICHT & CO., 27 Park Place, New York City. Circular illustrating and describing the Standco speed indicator, an instrument that combines a revolution counter and a surface speed indicator with a chronometer for timing the test period. 17

Lubricating Systems

BIJUR LUBRICATING CORPORATION, Long Island City, N. Y. Bulletin G, entitled "The Travels of Modern Lubrication," showing the application of the Bijur automatic lubricating system on different classes of machines in various industries. 18

Precision Boring Machines

STOKERUNIT CORPORATION, 4548 W. Mitchell St., Milwaukee, Wis. Catalogue illustrating and describing the Simplex precision boring machines for handling a variety of small and medium production jobs on an economical basis. 19

Flexible Shaft Equipment

N. A. STRAND & CO., 5001 N. Wolcott Ave., Chicago, Ill. Catalogue 27, illustrating the various styles of flexible shafts and machines made by this company. Complete specifications are included and illustrations showing various applications. 20

Gear Noise Testing

NATIONAL BROACH & MACHINE CO., Shoemaker and St. Jean Sts., Detroit, Mich. Circular entitled "Save Time and Expense by Sound-Checking Your Gears," illustrating and describing the Red Ring gear speeder which tests gears for noise. 21

Precision Grinders

BOYAR-SCHULTZ CORPORATION, 2110 Walnut St., Chicago, Ill. Bulletin illustrating and describing a new portable high-speed profile grinder for precision work, applicable in tool and die shops for finishing dies, templets, gages, and special shapes. 22

Gas-Fired Ovens and Heaters

GEHNRICH CORPORATION, Skillman Ave. and 35th St., Long Island City, N. Y. Bulletin 106, describing the Gehnrich line of gas-fired ovens and air heaters for industrial baking, drying, and heat-treating operations. 23

Flow Meters

BROWN INSTRUMENT CO., Wayne and Roberts Aves., Philadelphia, Pa. Folder 80-36, describing how costs have been reduced by the use of Brown flow meters for metering steam, water, oil, and other fluids. 24

Carboloy Inserted-Blade Milling Cutters

EX-CELL-O CORPORATION, 1212 Oakman Blvd., Detroit, Mich. Catalogue M-338, descriptive of Continental face milling cutters equipped with Carboloy-tipped inserted blades. 25

Welding Award

JAMES F. LINCOLN ARC WELDING FOUNDATION, Box 5728, Cleveland, Ohio. Circular advertising the $200,000 Foundation Award offered for papers relating to the arc-welding process. 26

Power Squaring Shears

NIAGARA MACHINE & TOOL WORKS, 637 Northland Ave., Buffalo, N. Y. Bulletin KL, illustrating and describing the Niagara Series KL power squaring shears, with capacities up to 3/8 inch. 27

To Obtain Copies of New Trade Literature

listed on pages 628-630 (without charge or obligation) mark with X in squares below, the publications wanted, using the identifying numbers at the end of each descriptive paragraph; detach and mail to:

MACHINERY, 148 Lafayette St., New York, N. Y.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44

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[This service is for those in charge of shop or engineering work.]

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Adjusting Shims

LAMINATED SHIM CO., INC., 21-42 Forty-fourth Ave., Long Island City, N. Y. Folder showing methods of obtaining quick and accurate adjustments of mechanical parts by the use of laminated shims and spacers. 28

Multiple-Spindle Drill Heads

GRAY HUB CO., 17265 Gable Ave., Detroit, Mich. Bulletin on the Gray multiple-spindle drill head, universal tapping attachment, ball-bearing rotary index table, and sheet-metal cleaning and oiling machine. 29

Carbo-Lathes

W. C. LIPE, INC., 208 S. Geddes St., Syracuse, N. Y. Catalogue illustrating and describing the Lipe Carbo-Lathe (formerly built by the Porter-Cable Machine Co.), designed to use carbide cutting tools. 30

Oil-Seal Packing

GARLOCK PACKING CO., Palmyra, N. Y. Catalogue illustrating the construction and application of the Garlock Split-Klozure oil seal, so designed that it can be installed without dismantling a machine. 31

Pressure Lubricators

AMERICAN CHAIN & CABLE CO., INC., York, Pa. Folder DH-1058, entitled "Pressure Lubrication Without Special Fittings," illustrating and describing the Acco-Morrow pressure lubricator. 32

Electric Motors

BARBER-COLMAN CO., Rockford, Ill. Motor Data Sheet M-11, giving the dimensions and performance characteristics of two-pole uni-directional and reversing motors. 33

Welding Equipment

LINCOLN ELECTRIC CO., Cleveland, Ohio. Welder Specification Bulletin No. 327, illustrating and describing the Lincoln Diesel-engine-driven "Shield Arc SAE" welder. 34

Die-Casting Machines

PHOENIX ICE MACHINE CO., 2703 Church Ave., Cleveland, Ohio. Folder illustrating and describing the new Lester HHP-1 die-casting machine designed to increase production. 35

Straightening Machines

F. J. LITTELL MACHINE CO., 4149 Ravenswood Ave., Chicago, Ill. Circular 3A, illustrating and describing Littell power-driven straightening machines. 36

Lathes

MONARCH MACHINE TOOL CO., Sidney, Ohio. Circular announcing the Monarch flame-hardened lathe bed, a recent improvement in the design of Monarch lathes. 37

Electric Furnaces

HAROLD E. TRENT CO., 618 N. 54th St., Philadelphia, Pa. Leaflet 26-TB, descriptive of Trent electric furnaces with "folded and formed" heating elements. 38

Multi-Pin High-Speed Clutches

FEDERAL PRESS CO., Elkhart, Ind. Circular announcing the new Federal multi-pin, heavy-duty, high-speed clutch designed for use on Federal presses. 39

Centrifugal Pumps

INGERSOLL-RAND CO., 11 Broadway, New York City. Bulletin 7067, on the Cameron two-stage centrifugal pump. 40

Milling Cutters

COWLES TOOL CO., Cleveland, Ohio. Bulletin illustrating and describing Cowles milling cutters with the new rigid-back method of blading. 41

Arbor Presses

FAMCO MACHINE CO., Racine, Wis. Folder ES-9, illustrating different types of arbor presses and foot presses. 42

Revolving Welding Table

RANSOME CONCRETE MACHINERY CO., Dunellen, N. J. Bulletin 151, descriptive of the Ransome revolving welding table. 43

Air Valves and Nozzles

F. J. LITTELL MACHINE CO., 4149 Ravenswood Ave., Chicago, Ill. Bulletin 9A on Littell air blast valves and nozzles for ejecting work. 44

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 631-651 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment mark with X in the squares below, the identifying number found at the end of each description on pages 631-651—or write directly to the manufacturer, mentioning machine as described in May MACHINERY.

51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	

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To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 626-627 mark with X in the squares below, the identifying number found at end of each description on pages 626-627—or write directly to the manufacturer, mentioning name of material as described in May MACHINERY.

201	202	203	204	205

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[SEE OTHER SIDE]

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

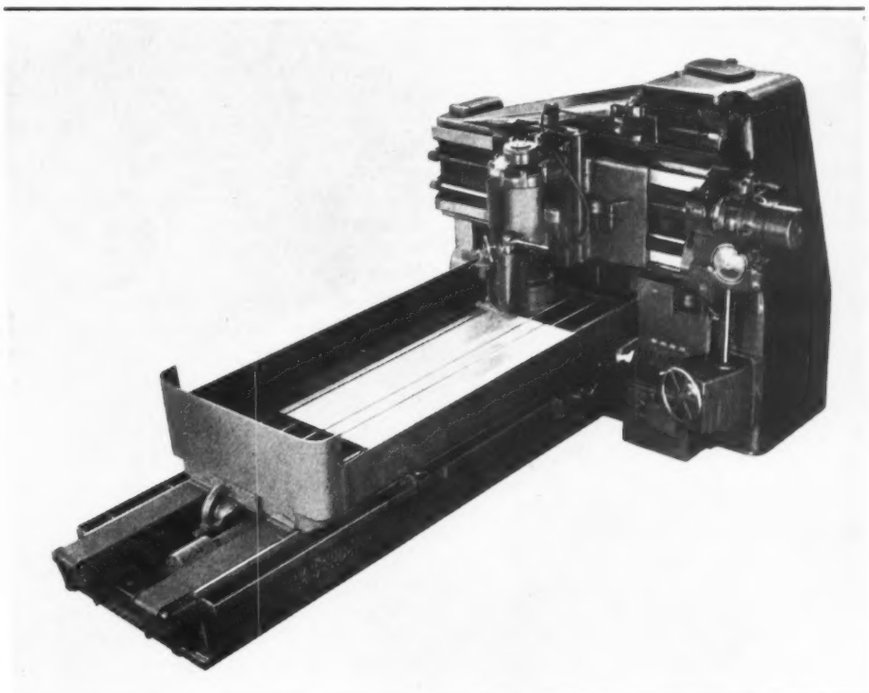
Hanchett Vertical-Spindle Planer Type Surface Grinding Machine

Probably the largest surface grinding machine of the planer type that has ever been regularly built and offered to the trade is announced by the Hanchett Mfg. Co., Big Rapids, Mich. The worktable of this machine has a finished surface 50 inches wide by 120 inches long. The maximum distance from the grinding surface of a new wheel to the top of the table is 20 inches. A segmental type wheel, 18 inches in diameter by 6 inches high, with a 1 1/2-inch face, is employed. Table speeds up to 60 feet per minute are available. Forced-feed lubrication is provided for the table ways.

Power elevation of the cross-rail is available at a speed of 3 feet per minute. Both housings are equipped with automatic clamps. The wheel-head has automatic down feed in increments of from 0.002 to 0.003 inch, and automatic cross-feed in steps of from 1/8 inch to 5 inches. The constant cross-feed of the wheel-head is at the rate of 30 feet per minute.

Incorporated in the coolant system of the machine is a welded boiler-plate tank having a capacity of 300 gallons. A 25-horsepower motor running at a speed of 900 revolutions per minute drives the grinding wheel spindle. The hydraulic pump is driven by a 15-horsepower motor running at 1200 revolutions per minute. The cross-feed of the grinding wheel head is driven by a 5-horsepower motor, also operating at a speed of 1200 revolutions per minute. Elevation of the entire cross-rail assembly is accomplished by means of a 10-horsepower motor having a speed of 1200 revolutions per minute. The coolant pump is driven by a 3/4-horsepower motor having a speed of 1800 revolutions per minute. The forced-feed lubrication system is driven by a 1/4-horsepower motor.

The weight of the complete machine is approximately 85,000 pounds. The machine requires a floor space of 160 inches wide by 350 inches long. The height of the machine is 120 inches. 51



Planer Type Vertical-spindle Surface Grinding Machine with a Table 50 by 120 Inches in Size, Built by the Hanchett Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 630.

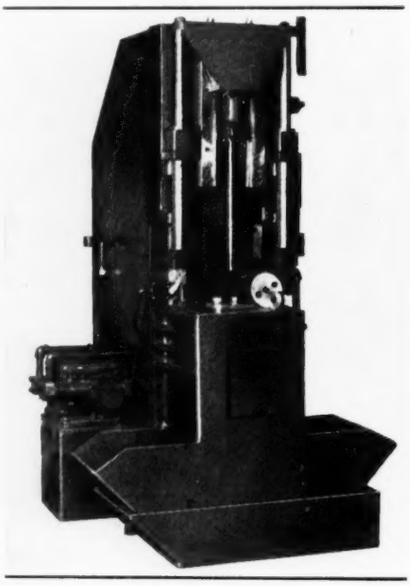


Fig. 1. Oilgear Six-ton Vertical Broaching Machine

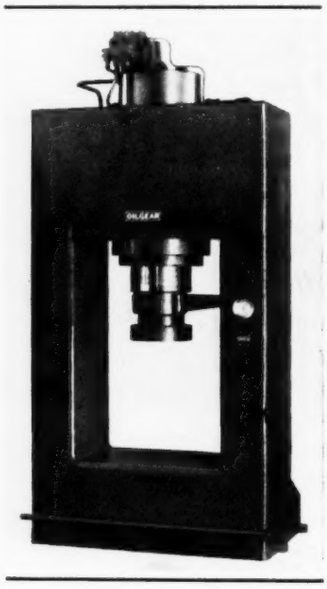


Fig. 2. Oilgear 300-ton Two-column High-speed Press

Oilgear Six-Ton Broaching Machine and 300-Ton High-Speed Press

A six-ton vertical pull-down broaching machine, on which the holes in crankshaft and camshaft timing gears can be broached to size within a tolerance of plus or minus 0.0005 inch at the rate of 270 gears an hour, has been brought out by the Oilgear Co., 1403 W. Bruce St., Milwaukee, Wis. The broaching operations are performed on the timing gears previous to hobbing and cutting the keyways, the latter operations being performed in combination with the marking of mating teeth on an Oilgear horizontal broaching machine.

The principal features of this machine include convenient stationary loading level; hydraulically operated tool-handling slide; automatic lower broach-puller; tool support on both ends for first portion of stroke; positive and continuous lubrication of tool and work; automatic lubrication of hardened steel ways; simple push-button production control with emergency stop; separate push-button set-up control; and Oilgear controlled fluid power operation. These features eliminate the handling of the broach, threading of the work over the broach shank, and centralizing of the work by hand. This machine is so designed that the main slide can also be used for surface broaching.

Cams on both sides of the machine can be adjusted to suit the stroke required. A two-way variable delivery pump supplies fluid power for quick, controlled operation of both slides. The cutting and return speeds can be adjusted independently.

The normal capacity of the machine is 12,000 pounds, and the peak capacity 18,000 pounds. The stroke is adjustable up to a maximum of 24 inches, and the cutting speed is variable from 4 to 35 feet per minute. The return speed is variable up to a maximum of 60 feet per minute. The tool handling cylinder speed is approximately 50 feet per minute. The weight is 7000 pounds.

Another machine recently brought out by the Oilgear Co. is the 300-ton, two-column speed press shown in Fig. 2. Malleable-iron castings can be die straightened on this press under a cushioned squeeze to the proper shape within close tolerances. In operation, depressing the hand-lever or foot-treadle, causes the ram to approach the work rapidly and then automatically slow down to the pressing or full tonnage speed when the work is reached. The ram continues downward until maximum tonnage or the positive stop is reached, and it will maintain full tonnage on the work until the operator releases the hand-lever or foot-treadle. This pressing operation is performed without excessive heating or loss of power. The operator can "inch," reverse, or stop the ram at will. By adjusting the pump unloading control, the maximum working force of the press can be reduced for lighter work.

General specifications for this press are: Capacity, 100 to 300 tons; stroke, 24 inches; daylight space, 42 inches; variable rapid traverse downward to a maximum of 220 inches per minute; variable rapid traverse upward to a maximum of 250 inches per minute; variable pressing speed downward to a maximum of 15 inches per minute; width between columns, 42 inches; and weight, 26,500 pounds. 52

Reed-Prentice Plastic Molding Machine

The Reed-Prentice Corporation, Worcester, Mass., has just announced a 10B plastic injection molding machine of similar design to the 10A machine described in the October, 1937, number of MACHINERY. The main difference between these machines is in their capacity. The capacity of the 10B machine has been increased to 4 ounces, with a 24 square inch area at a maximum pressure of 26,000 pounds, or 6 ounces, with an area of 40 square inches at a maximum pressure of 16,000 pounds. The locking pressure of the toggle mechanism is 85 tons. The machine weighs 12,000 pounds.

The equipment includes a Vickers hydraulic pump with a valve control, automatic indicating control pyrometer, two rheostats for heat control, three nozzles, a grease gun, and a set of wrenches. 53

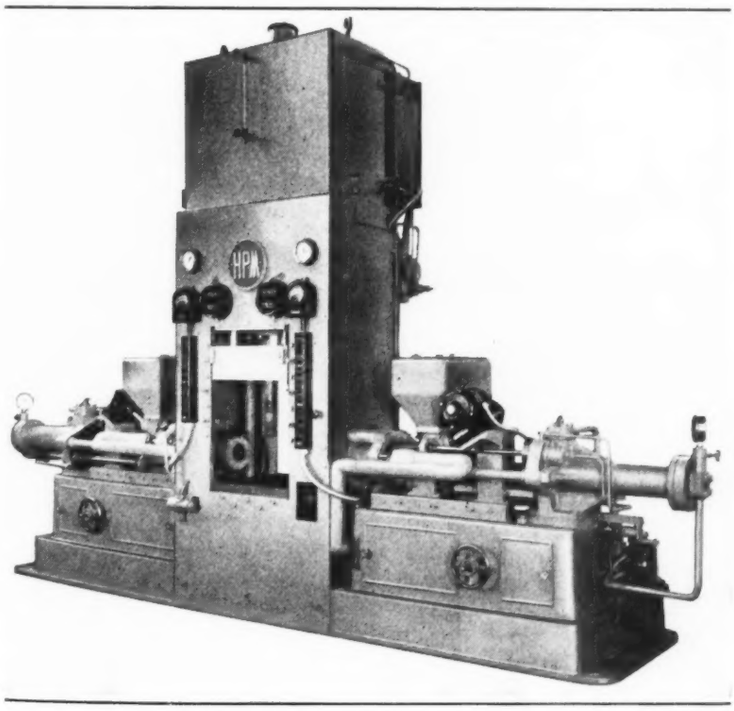
To obtain additional information on equipment described on this page, see lower part of page 630.

Hydro-Power Injection Molding Press

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has recently introduced the Model 100 H-P-M hydro-power injection molding press here illustrated for molding thermo-setting materials, such as Bakelite. This machine has a clamping pressure capacity of 100 tons; a maximum projected mold cavity area of 30 to 60 square inches, depending on the shape and type of the work; a plasticizing capacity of approximately 80 to 100 pounds per hour; and an operating speed of two complete cycles per minute.

A vertical downward acting mold clamp is mounted on a base, together with two injection units, one on each side. The capacity of each unit is 8 ounces, giving a total capacity of 16 ounces. These units are arranged to move toward the mold when it is clamped, so that the injection nozzles engage sockets on the parting line of the mold.

The power unit for operating the clamp is mounted overhead, on the back of the frame. Separate power units for each injection unit are mounted on auxiliary reservoirs back of the injection cylinder supports. A hydraulic ejector is built in the base of the clamp, which is controlled manually by a small valve. 54

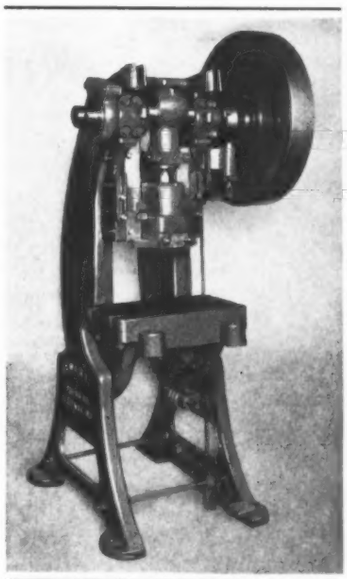


Injection Molding Press Built by the Hydraulic Press Mfg. Co.

Multi-Pin Clutch for Federal Presses

The Federal Press Co., Elkhart, Ind., has just placed on the market a multi-pin clutch which is available in capacities to suit all sizes of Federal presses. Multiple pins mounted in the crankshaft engage a like number of openings in a steel plate attached to the flywheel. This arrangement has been developed to provide instantaneous action when the press is tripped and to give the clutch more power and longer life.

Power is transmitted from the flywheel directly to the crankshaft by the clutch pins. With this arrangement, the power is transmitted through the entire circumference of the shaft, distributing the load equally without excessive strain on the flywheel end. The pins are moved in and out of engagement by a cam, operated by a shaft, on the contacting end of which a roller is attached for reducing wear. The other end of this shaft is attached to the tripping rod; thus when the press is tripped, the shaft is moved toward the rear of the press, releasing the cam, which forces the pins into the wheel.



Federal Press Equipped with Multi-pin Clutch

All parts of the clutch, as well as the flywheel facing, can be easily replaced. A flywheel facing that will allow backlash for testing dies can be provided, or a close fitting facing can be furnished for continuous roll feed work or for cases where pressure pads are used to avoid recoil. The facing can be changed at any time to either eliminate or provide backlash as required.

Incorporated in the clutch is a simple positive single-stroke tripping mechanism. This mechanism is easily engaged or disengaged for single stroke or continuous operation. Another feature is a safety device, which makes it impossible for the clutch to be engaged when setting dies while the flywheel is in motion, in case the foot-pedal should be accidentally depressed. 55

To obtain additional information on equipment described on this page, see lower part of page 630.

Heald Double-End Bore-Matic

A precision boring machine designed especially for boring large heavy work, such as machine tool units, including spindle-carriers for screw machines, work-heads, driving heads and cutter-heads for gear-cutting machines, and headstocks for lathes, has been added to the line of Bore-Matics built by the Heald Machine Co., Worcester, Mass.

This machine, known as the No. 45 double-end Bore-Matic, can be furnished for boring work from one end or from both ends. The boring heads are mounted on the bridge, which has a capacity for holding from three to seven heads, depending on their size. The heads are driven by V-belts, which permits varying the speed by simply changing the pulleys.

The table has a large finished pad with three T-slots for holding fixtures and slides on flat and V-ways. The top of the table is only 22 inches from the floor. The table is driven by a hydraulic system which furnishes a wide range of feeds. The boring heads at each end of the machine are driven individually by direct-current motors mounted on separate sub-bases at the rear of the machine. The motors are of the variable-speed type controlled by a rheostat at the front of the machine for varying the speed.

Starting and stopping of the boring heads are controlled by push-buttons in individual control panels at the front of the machine. The push-buttons place the boring heads under automatic control or enable them to be "jogged" when making setups. The control panel is provided with push-buttons for controlling the main drive motor, starting, stopping, and reversing the table.

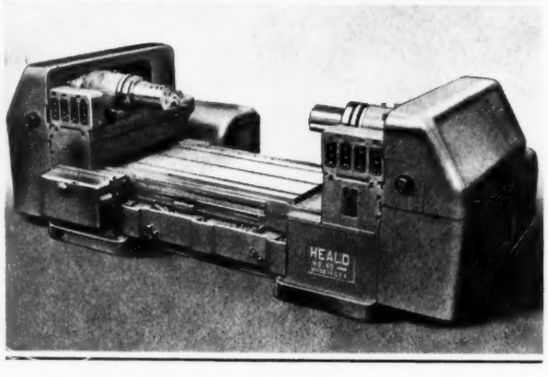
The machine has ample capacity for handling several sizes of headstocks. The table is 104 inches long by 36 inches wide, with a scraped pad 54 by 28 inches. The distance between the bridges mounted on the pads of the machine base is 70 3/4 inches. The boring heads are mounted on "raising" blocks. The machine has a stroke of 30 inches, and the net weight with four heads is 19,590 pounds. A floor space of 84 by 144 inches is required. 56

Colonial High-Speed Horizontal Broaching Machine

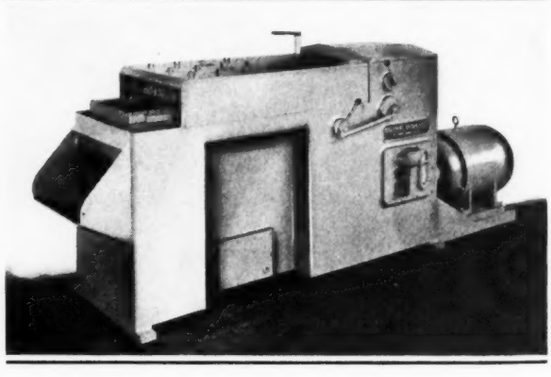
Two flat surfaces are broached on steel hydraulic-brake couplings at the rate of 3000 couplings an hour on a special automatic broaching machine made by the Colonial Broach Co., 147 Jos. Campau Ave., Detroit, Mich. This high-speed, horizontal, hydraulically operated machine is completely enclosed. In use, the operator merely starts the machine and drops the parts into two loading apertures in the top. The finished parts are ejected into a basket at the left.

There are two sets of stationary broaches through which two pieces of work are pushed simultaneously at each stroke of the ram. The machine shown broaches two flats on the round shank of the brake coupling, which must be in correct angular relation to the hexagonal section of the coupling. As the couplings are fed into place for broaching they are gripped by spring-loaded hexagonal-shaped jaws. When the ram pushes the part through the broaches, the jaws are opened against the spring pressure. The teeth of the stationary broaches are so designed as to come in contact with the pieces simultaneously, thus preventing the work from turning. The bottom and sides of the part are in contact with hardened and ground rails, which maintains accurate vertical and horizontal alignment. The stationary broaches are arranged in sub-bars, permitting ready removal in sections to facilitate servicing and replacement.

The machine is provided with coolant ducts designed to flood the space between the broach teeth and wash out the chips. The machine is rated at 4 tons capacity, has an 18-inch stroke, and is driven by a 7 1/2-horsepower motor. The cycle is set to give a broaching speed of 45 feet per minute and a ram return speed of 90 feet per minute. 57

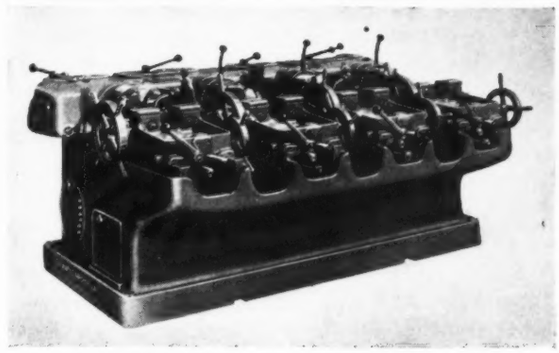


Heald Double-end Precision Boring Machine



Colonial High-speed Broaching Machine

To obtain additional information on equipment described on this page, see lower part of page 630.



Landis Threading Machine Equipped with Four Heads

Boyar-Schultz Bench Type Precision Profile Grinder

Landis Quadruple-Head Threading Machine

The Landis Machine Co., Inc., Waynesboro, Pa., has recently added a quadruple-head threading machine to its line of "Landmaco" threading machines. All the mechanical features of the Landmaco threading machines have been incorporated in the design of the new machine, which consists of four threading units assembled on a single bed. The production possibilities for certain classes of threading operations have been greatly increased by the two additional threading units.

This quadruple-head machine is particularly adapted to jobbing and maintenance work, especially in railroad shops, where it may be desirable to set each die-head to a different diameter, thus eliminating the necessity for frequent changing of the chasers.

The selective type gear-box provides eight threading speeds. The main spindle is driven by a spiral bevel gear, and is mounted on a preloaded anti-friction bearing at the die-head end to eliminate the possibility of any wear or end play in the spindle. The guides are covered by telescoping steel guards to protect them from chips, and wipers are attached to the carriage at the rear to prevent chips from reaching the wearing surfaces.

Provision is made for equipping the left-hand spindle with the Landis reverse taper die-head, which is designed especially for threading taper-head, radial crown bolts. This feature is particularly desirable in machines installed in railroad and jobbing shops. The center distances between the die-heads on this quadruple threading machine are the same as on the Landmaco double-head machine. The comparatively short center distances make it convenient for one man to operate four die-heads. 58

Bench Type Precision Profile Grinder

A bench model high-speed profile grinder designed to eliminate hand-stoning in fitting dies and punches and in finishing templets, gages, cams, and special shapes is being placed on the market by the Boyar-Schultz Corporation, 2110 Walnut St., Chicago, Ill. This profile grinder is built with a precision spindle that revolves at 20,000 revolutions per minute, on which grinding wheels of various sizes can be used.

The revolving spindle can be instantly adjusted to provide a reciprocating movement in a vertical plane to assure even wear on the grinding wheel and give the surface ground an exceptionally smooth finish. The work-table has a sine bar arrangement for accurately setting it to any desired angle up to 5 degrees. A diamond wheel-dresser designed for attachment to the work-table is furnished with the machine. The motor and all moving parts, except the grinding wheel, are enclosed in a ventilated cast-aluminum housing. 59

"Smootharc" Welding Electrodes Protected by Vacuum Packing

The "Smootharc" welding electrodes made by the Harnischfeger Corporation, 4400 W. National Ave., Milwaukee, Wis., are now being put out in vacuum-packed cans to keep them fresh over an indefinite period of time. The electrodes are taken from the drying ovens and immediately placed in the new containers. The tops of the containers are hermetically sealed, so that their contents remain in "oven fresh" condition, regardless of the amount of moisture present where the containers are stored.

A new electrode, the "Smootharc 110," developed for use in building up car wheels, rail ends, and for flame-hardening, is another product recently announced by the company. The base metal of this electrode contains approximately 1 per cent carbon, and the coating is designed to eliminate the brittleness common to high-carbon deposits. The arc stability of this electrode makes it especially suited for the flame-hardening of gears fabricated by the welding process. Where no further treatment is given after welding, the hardness ranges from 20 to 40 Rockwell C, depending on the rate of cooling. Drastic quenching operations,

To obtain additional information on equipment described on this page, see lower part of page 630.

such as are used in flame-hardening, give hardness values as high as 62 Rockwell C. The metal deposited by this electrode is not machineable. The electrodes are available in sizes of from 3/32 to 1/4 inch for currents ranging from 30 to 300 amperes. 60

Pratt & Whitney Open-Side Jig Borer

A jig borer adapted for boring operations on jigs and fixtures or for use as a "jig eliminator" on precision boring jobs when no time is available for making jigs or fixtures or when the quantity is too small to warrant making them has been developed by Pratt & Whitney Division Niles-Bement-Pond Co., Hartford, Conn. This new machine, designated No. 1 1/2B, is like the larger P & W Nos. 2A and 3B jig borers in principle, and, like these larger machines, is capable of working to tolerances of 0.0001 inch.

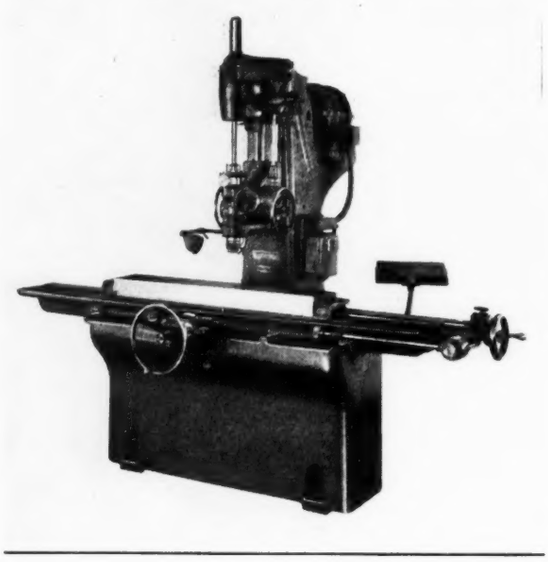
The machine illustrated has a table with a working surface of 10 by 48 inches and a longitudinal travel of 42 inches. The variable-speed spindle drive is through hardened spiral-bevel gears running in an oil spray. There are eight spindle speeds ranging from 130 to 1800 revolutions per minute, which makes the machine equally well adapted for drilling, boring, or reaming. The hardened, ground, and precision-lapped spindle quill is 3 inches in diameter and has a travel of 5 inches. The spindle has a No. 2 Morse taper hole and is mounted on permanently sealed, preloaded, precision ball bearings.

The direct thrust of the cutting tool is taken upon a horizontal table supported by a heavy bed. The open-side construction and the vertical spindle arrangement enable the operator to follow closely the progress of his machining operations and permit a wide range of rotary table applications. The table traversing screws are in no sense leadscrews and have no connection with the measuring instruments, so that any possible errors or wear in these screws will not impair the accuracy of the work. The measuring instruments are never under any appreciable pressure. 61

Quickwork Trimming, Beading, and Flanging Machine

A machine developed for trimming, beading, flanging, and forming stampings has recently been brought out by the Quickwork Co., 2313-17 Chicago Daily News Bldg., Chicago, Ill. This machine can be used for trimming and forming shells or stampings ranging from 4 by 6 inches up to 3 by 7 feet. The stamping is gaged from the table top, and the contours of the revolving rolls are made to fit the stamping. The machine will handle material ranging from 24 to 12 gage.

The rolls revolve continuously, and are opened by moving one roll away from the other to permit loading and unloading. The small roll or cutter, as the case may be, has horizontal adjustment, and is moved toward or away from the large roll by means of an air cylinder operated by a foot-valve. The large roller or cutter can be adjusted vertically. The table is provided with vertical adjustment when required by the nature of the stamping that is to be formed or trimmed. 62



Pratt & Whitney Open-side Jig Borer

Quickwork Trimming and Beading Machine

To obtain additional information on equipment described on this page, see lower part of page 630.

Grinding Head Equipment for Use on Boring Mill

A self-contained grinding head attachment arranged to fit a standard boring mill cross-rail, which is designed to replace the left-hand head usually furnished, has been developed by the Cincinnati Planer Co., Cincinnati, Ohio. This head is built as a standard unit and arranged to be attached to this company's 4-foot boring mill. With a machine thus equipped, boring and finish-grinding operations can be performed in one set-up on many different kinds of work. The drive to the grinding wheel is obtained through a two-speed Texrope box, upon which the motor is mounted. The hollow octagon ram is fitted with precision bearings which support the drive-shaft to which the grinding quill is attached.

Quills that vary both in length and diameter can be furnished to suit requirements. A hand-operated wheel-truing device having adjustment for both height and wheel diameter is rigidly mounted on the swivel-head. Both feed and rapid-traverse movements are provided for all positions of the grinding wheel. Vertical feeding of the grinding wheel is controlled through dogs mounted on the ram, which enable cuts to be made in both directions automatically.

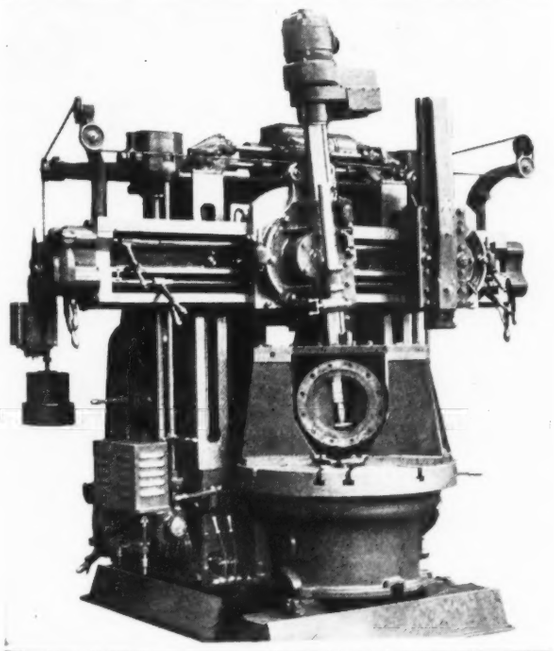
For "sparking out" work, the horizontal feed can be manually disengaged at any time without interrupting the up-and-down feeding movements. The work shown in the illustration consists of a valve mounted in a fixture, the head of which is located in an angular position for grinding a tapered hole. 63

Dreses Horizontal Drilling, Boring, and Milling Machine

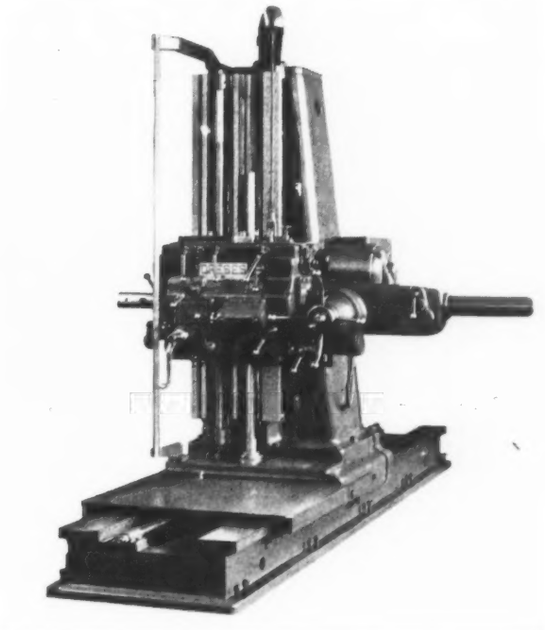
A new line of horizontal drilling, boring, and milling machines consisting of floor types and types having stationary, sliding, and compound tables, developed by the Dreses Machine Tool Co., Cincinnati, Ohio, is being placed on the market by the Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill. These machines are all completely anti-friction bearing equipped, including the spindle drive mechanism, feed-change and feed-distribution mechanism, hand-adjustment shafts, table and saddle clamp shafts, and even the counterweight sheaves. The spindle head of the standard floor type machine shown in the illustration has a vertical travel of 48 inches, and the column has a horizontal travel of 120 inches.

The standard spindle head and column are so designed that they can be adapted to existing floor type runways. The spindle head contains the entire spindle speed change-gears, the feed change-gears, the feed-distribution mechanisms, and a flange-mounted reversible motor. Only seventeen gears are used to obtain twenty-four speeds.

A spindle head having twenty-four spindle speeds in three different ranges may be had—namely, 12 to 700, 16 1/2 to 1000, or 24 to 1420 revolutions



Cincinnati Boring Mill Equipped with Grinding Head Unit



Dreses Horizontal Drilling, Boring, and Milling Machine

To obtain additional information on equipment described on this page, see lower part of page 630.

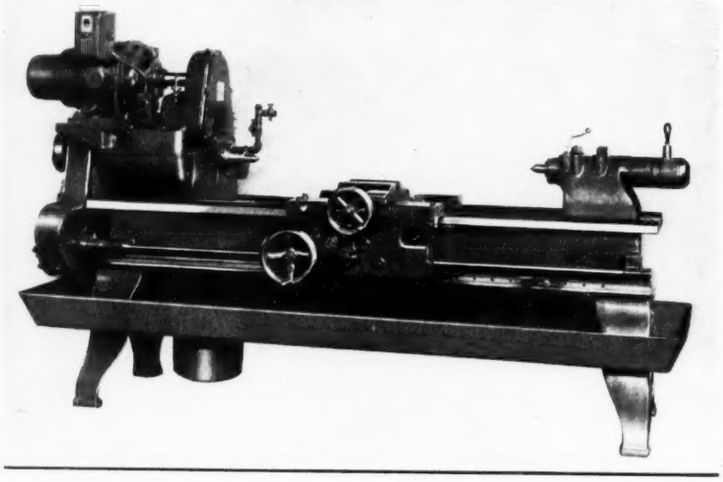
per minute. Also, heads with special modifications of these speeds can be furnished. There are eight boring and drilling feeds to the spindle, and eight milling feeds to the head and column, or sixteen milling feeds to the head, table, and saddle of the compound table type machine. The completely enclosed head has all mechanisms automatically oiled. Other units operate in an oil bath.

The columns are made in sizes to give the spindle head a vertical travel of 24, 36, 48, 60, or 72 inches. Machines with any desired column travel on the runways from a minimum of 24 inches upward can be furnished. Stationary tables are available in various sizes which can be mounted on a bedplate or attached to the runway of a floor type machine. Simple sliding tables mounted on a bed, and compound tables consisting of a standard table mounted on a saddle, can be provided. Table sizes range from 38 by 60 up to 48 by 72 inches. Beds for the tables 36 inches over the ways are available in three lengths—72, 96, and 120 inches. 64

Reed-Prentice Single-Purpose Lathe for Heavy Work

The Reed-Prentice Corporation, Worcester, Mass., has recently developed a single-purpose plain turning lathe for heavy machining operations on shells and for other classes of turning work on rifles, as well as for gun barrel turning on machine guns, etc. Different spindle speeds and feeds are obtained with pick-off gears between the motor and the headstock and between the spindle and the feed-rod mechanism.

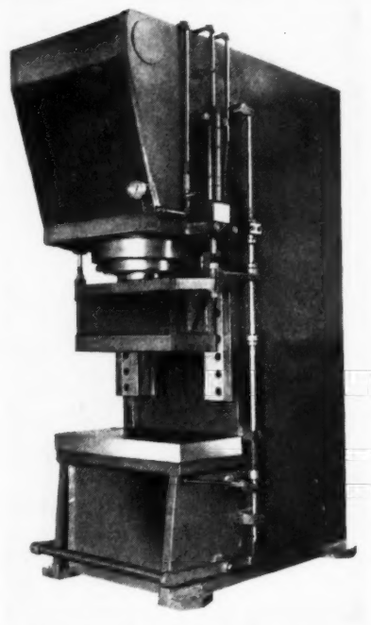
This lathe has a swing over the ways of 16 1/2 inches, and a swing over the bridge of 10 3/8 inches. The distance between centers on the 5-foot bed lathe is 17 inches. This lathe can also be furnished with 6-, 7-, 8- and 10-foot beds. The weight of the machine with a 5-foot bed is 2900 pounds. 65



Reed-Prentice Lathe Developed for Heavy Turning Operations on Shells and Gun Barrels

Verson Hydraulic Presses

A complete line of hydraulic presses for drawing, forging, straightening, forming, flanging, die-spotting, and similar operations has been developed by the Verson Allsteel Press Co., 9307 S. Kenwood Ave., Chicago, Ill. The 200-ton gap type press



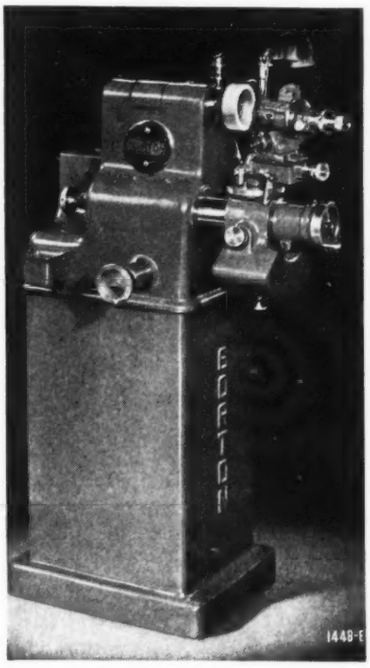
Verson 200-ton Gap Type Press

shown in the illustration has an 11 1/2-inch main ram and two traversing cylinders. The maximum working pressure is 3000 pounds per square inch, and the stroke is 12 inches. The downward pressing speed of this machine is 37.6 inches per minute, and the downward rapid traverse speed is 464 inches per minute. The rapid return speed is 660 inches per minute. The machine is controlled by a foot-lever and an emergency hand-lever. 66

Van Keuren High-Speed Steel Measuring Wires

A complete set of thread measuring wires made of high-speed steel has been brought out by the Van Keuren Co., 12 Copeland St., Watertown, Boston, Mass. This new set of wires, designated No. 20 HS, includes "best size" wires, which make contact at the pitch diameter for twenty different pitches ranging from 6 to 36 pitch. The use of high-speed steel for these measuring wires is said to increase their life over carbon steel wires about 300 per cent. 67

To obtain additional information on equipment described on this page, see lower part of page 630.



Gorton Cutter Grinder

Gorton Cutter Grinder for Die and Mold Cutters

A cutter grinder designed particularly for grinding single-flute cutters has been added to the line of machines made by the George Gorton Machine Co., 1109 Thirteenth St., Racine, Wis. This grinder will also grind other types of small cutters used in die and mold cutting, pantograph engraving, and profiling work. Two- and four-flute cutters and cutters with two, three, or four sides or flats can be ground. Indexing is accomplished by means of a dial and plunger. This grinder, equipped with a universal tool-head, will also grind cutters to any desired diameter, taper, shape, or clearance, and with a square, conical, or ball nose. Micrometer adjustments are provided on all dials.

Carbide cutters can be ground in any one of the shapes and sizes mentioned on interchangeable diamond impregnated wheels. Straight cup-wheels are provided for single-flute cutter grinding, and flaring cup-wheels for multi-flute and spiral-flute cutters. 68

Portable Metal-Cutting Hacksaw

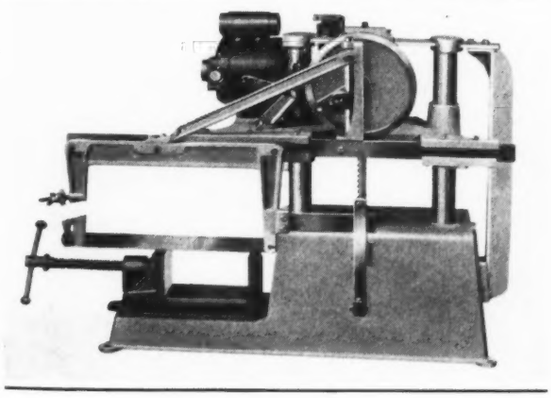
A portable motor-driven hacksaw designed with a movement that automatically applies the correct pressure for cutting metal of any degree of hardness and that will hold the saw at any position without danger of its falling has been brought out by the Master Machine Co., 872 W. North Ave., Chicago, Ill. It is claimed that no oil, grease, or liquid is required to lubricate or cool the saw blade, which can be operated at high speed without overheating the blade or the stock.

This machine is designed to operate without vibration and to cut thin tubing without bruising or tearing the material. It has a capacity for cutting round or square stock up to 7 inches in diameter. Stock up to 5 inches in diameter can be cut at a 45-degree angle by a simple adjustment of the vise. Provision is made for changing the length of the stroke to 2, 5, or 6 inches.

The machine is driven by a 1/2-horsepower General Electric motor, operating on 110-220 volts alternating or direct current, or a 1/2-horsepower gasoline motor. Manual controls consist of one electric switch, one clutch handle, and one vise handle. One high-speed hacksaw blade is included with each machine. 69

Indicator Attachment for Cincinnati Centerless Grinders

An attachment for Cincinnati Nos. 2 and 3 centerless grinding machines, which is equipped with a dial gage that facilitates adjustment of the regulating wheel-slide to compensate for wheel wear and to keep the work diameter within the specified tolerances, has been brought out by Cincinnati Grinders Incorporated, Cincinnati, Ohio. The attachment consists of a bracket which is bolted to the upper slide, a steel rod carrying a contact dog, a supporting bracket bolted to the machine bed, and a 0.0001-inch dial indicator gage having a 3-inch face.



Portable Motor-driven Hacksaw Brought out by the Master Machine Co.

Cincinnati Centerless Grinding Machine Equipped with a Precision Indicator

To obtain additional information on equipment described on this page, see lower part of page 630.

The indicator gage, located as shown in the illustration, is protected against injury by a stop-lug which limits the movement of the indicator finger, after contact, to a distance of 0.2 inch. When this limit is reached, the contact dog strikes the stop-lug and slides back on the rod. This attachment can be mounted on machines already in use. 70

Sisalin Sections for Polishing and Buffing Wheels

A tough fiber known as "Sisal," which is used in the manufacture of rope and binder twine, is employed by the Hanson-Van Winkle-Munning Co., Matawan, N. J., in the construction of material known as Sisalin sections. This material is used to produce a wheel having the appearance of a cotton buffing wheel. Sisal, in a specially prepared mat form, is interleaved with alternate layers of muslin and bound together by various types of sewing to produce the Sisalin sections.

The proper use of this product is for intermediate operations between polishing and buffing. It is especially effective in removing minor imperfections or die marks, and is recommended for use on carbon steel, stainless steel, brass, copper, and aluminum. The compounds recommended for use with Sisalin wheels are Tripoli, stainless steel rouge, and emery paste. 71

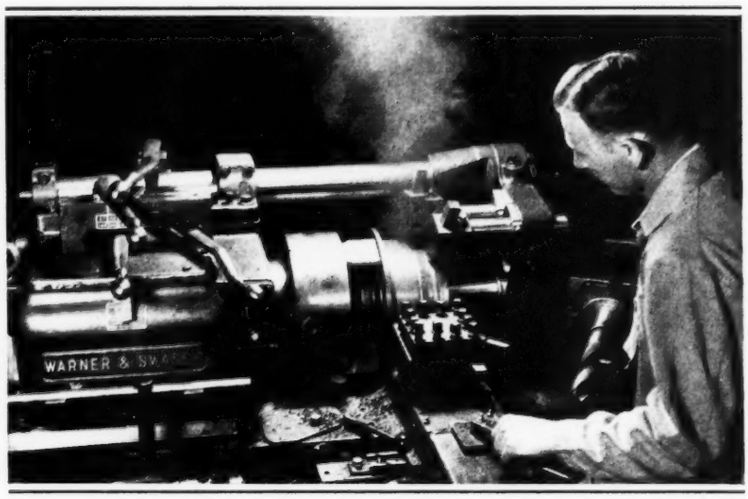


Fig. 1. Warner & Swasey Heavy-duty, Multiple Turning Head and Stationary Pilot Bar Mounted on Headstock

Warner & Swasey New Line of Turret Lathe Tools

A complete new line of tools for turret lathes that meet the requirements of tungsten-carbide cutters has been announced by the Warner & Swasey Co., Cleveland, Ohio. A large number of new tools, holding devices, and miscellaneous equipment designed in accordance with modern conceptions of speed and power are included in this line. Practically all the old tools, if not completely redesigned, have been improved. Improvements have been made in practically every attachment through the use of adjustable cutters, simplified clamping devices, etc., to obtain the important advantage of reduced set-up time.

In Fig. 1 is shown a heavy-duty turning head and stationary overhead pilot bar mounted on the turret lathe headstock. With this arrangement, only one overhead pilot bar is needed to serve any number of heads on one turret. The new pilot bars have been designed to have at least twice the strength of previous pilot bars.

The heavy-duty adjustable-angle cutter-holder shown in Fig. 2 is built for taking heavy roughing cuts. The head is adjustable for finishing cuts that require accurate cutter setting. It is made offset and reversible to provide full cutter support over a wide range of diameters.

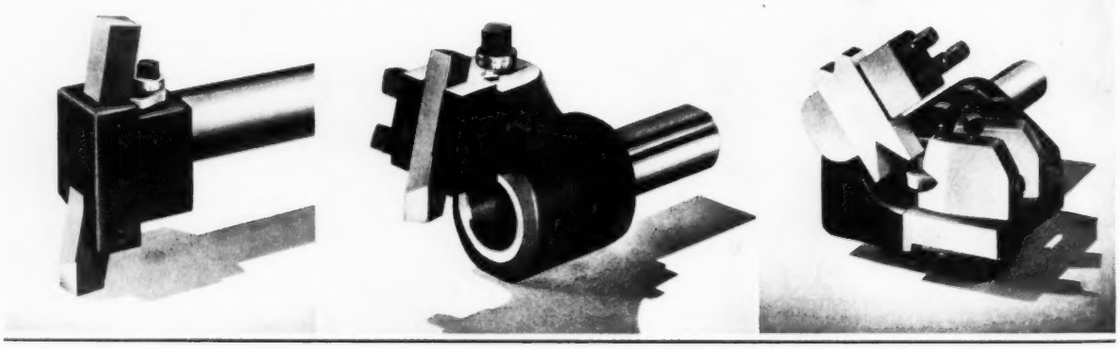


Fig. 2. Warner & Swasey Heavy-duty Adjustable-angle Cutter-holder. Fig. 3. Adjustable-knee Tool Designed for Quick Set-up on Short Bar Work. Fig. 4. Multiple-cutter Box Turner

To obtain additional information on equipment described on this page, see lower part of page 630.

Another important development is an adjustable single turning head which has one hole adjustable in the vertical position. With this tool, the turning cutter holder, held in an adjustable block, is quickly set to size, and can be changed from one job to another by simply moving the block up and down. A two-cutter facing block designed to hold two facing cutters in a wide range of positions is still another development which permits holding shoulders to accurate lengths without depending on machine stops.

In Fig. 3 is shown an adjustable-knee tool designed for quick set-ups on short bar work. The cutter is adjusted by turning the graduated screw. Drilling, boring, or centering cuts are combined with turning by holding drills or stub boring-bars in the center hole.

The multiple-cutter box turner shown in Fig. 4 is designed for use on brass or other free-cutting materials when turning more than one diameter at high speeds. The V-back rest is adjustable to size. The first cutter may either precede or follow the back-rest.

In Fig. 5 is shown a multiple-cutter turner which can be set up quickly for turning several diameters on bar work simultaneously. This cutter has been designed to take multiple cuts with heavy feeds.

The combination end facer and turner shown in Fig. 6 performs two types of work. Using a square cutter, it can be employed as a single-cutter turner. When equipped with a flat cutter, this tool can be used for end-facing operations.

In Fig. 7 is shown a quick-acting slide tool with a shank mounting. This is an entirely new tool designed for fast recessing and facing cuts on hard and soft metals. The slide moves 1/2 inch with a one-quarter turn of the handle. A taper turner with roller back-rest for turning locomotive frame bolts is another tool included in the new line.

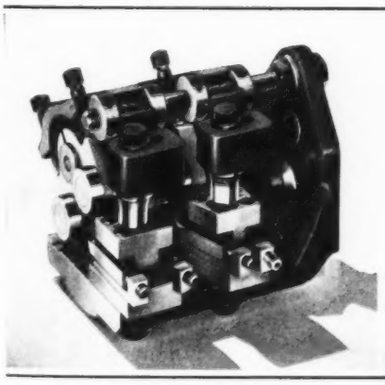
A completely new line of chucks in the heavy-duty class has also been brought out. These chucks are designed for increased speeds and heavier cuts. They are more massive than previous models, and have increased holding power. There are two other important developments in the new line; all the chucks are adaptable to flanged spindles, and they all have provision for pressure grease lubrication. In the T-slot type chucks, the master jaws are recessed below the face of the chuck to permit fixtures to be mounted without removing the master jaws. 72

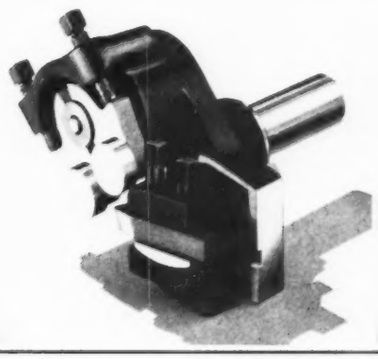
Garlock "Split Klozure" Oil Seal

A patented oil seal known as the Garlock "Split Klozure," which is split or cut open to permit it to be placed around a shaft in somewhat the same manner as an ordinary packing ring, instead of sliding it over the end of the shaft, as is necessary with solid oil seals of conventional type, has been brought out by the Garlock Packing Co., Palmyra, N. Y.

Garlock "Split Klozure" Type of Oil Seal

The sealing ring material is the same compound employed for the regular Garlock Klozures and is especially well suited for oil seal service. The Split Klozure ring consists of the composition sealing element or packing ring molded into a cross-sectional shape resembling a modified vee to which is bonded, under pressure, a finger type spring. The sealing element and spring thus combined in one piece are applied as a single unit. This packing ring is made for shafts in sizes from 3 to 52 inches in diameter. 73





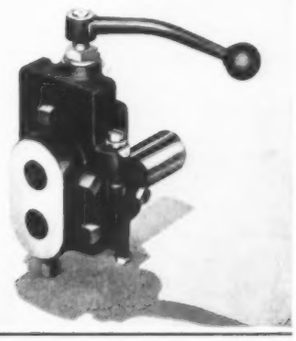


Fig. 5. Warner & Swasey Multiple-cutter Turner. Fig. 6. Combination End Facer and Turner. Fig. 7. Quick-acting Slide Tool with Shank Mounting

To obtain additional information on equipment described on this page, see lower part of page 630.

Werner "Microlux" Comparator Marketed by George Scherr Co.

Werner "Microlux" Mirror Type Comparator

An improved model of the Werner "Microlux" comparator is being placed on the market by the George Scherr Co., 128 Lafayette St., New York City. This comparator is designed for the accurate and rapid inspection of a great variety of small parts. The piece to be tested is placed on the adjustable and interchangeable table against a stop. The feeler of the lever is brought in contact with the piece at the correct pressure, independently of the operator.

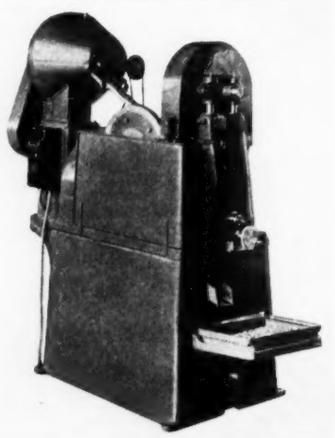
The result of the inspection is read on a screen on which a dark line in a lighted circle appears in a position corresponding to the size of the piece being tested. To expedite the reading, the screen is provided with a graduated scale and two sets of tolerance pointers.

A magnification of 1000 to 1 is obtained by three separate units: The pivoted lever; the spindle unit containing the measuring plunger; and the tilting mirror. The light source is located in the top of the housing instead of the bottom, with provision for upward distribution of heat.

All moving parts of the indicator mechanism are protected in a closed housing. The stand of the new comparator has been completely redesigned and is about twice as heavy as on previous models. The supporting post has a steep-pitch thread for rapid coarse adjustment through a knurled ring nut. The backstop is now adjustable in vertical and horizontal planes, and the measuring anvil can be readily changed or replaced by special fixtures, such as the tilting prism shown in the illustration, used for checking round work. 74

Automatic Screw-Head Slotting Machine

An automatic machine that uses a band saw 5/8 inch wide by 6 feet 10 inches long for slotting screw-heads and similar work has recently been developed by the Lindgren & Son Mfg. Co., 751 Central Ave., Bridgeport, Conn. The machine shown in the illustration is arranged for slotting brass electrical binding post screws, which are automatically hopper-fed, clamped, slotted, and ejected at a high production rate. The band saw cuts a smooth, practically flat-bottom slot in the screw-head. The work-carrier is easily adjusted for different sized screws and extra work-carriers can be furnished to handle a wide variety of sizes.

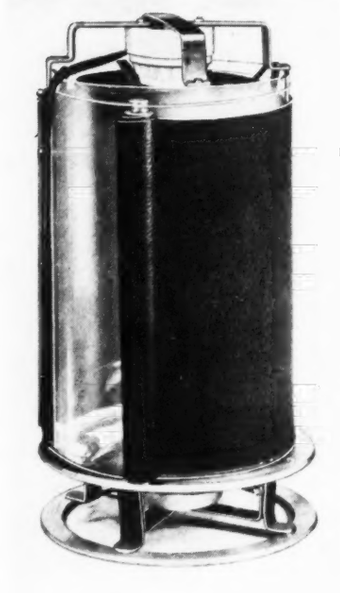


Lindgren Automatic Screw-head Slotting Machine

The machine is driven by a one-horsepower motor. Coolant is supplied to the saw through a gear-driven pump from a coolant tank in the base of the machine. Adjustments are provided for depth of slot and for centering and clamping. The machine can be adapted for other types of work not requiring hopper feeds. A similar machine, but equipped for hand feed, was recently built for slotting two sizes of malleable-iron BX connectors. 75

Portable Blueprinting Machine

A small portable blueprinting unit, designed for plugging into a lighting circuit, has been brought out by the Vandenwood Co., 3030 Euclid Ave., Cleveland, Ohio. The unit is provided with a portable case, complete with washing and fixing trays, fixing salts, and a supply of ready cut sensitive paper 8 1/2 by 11 inches. The machine will make prints up to 9 by 18 inches, and is intended for use where regular blueprinting equipment is not available. 76



Vandenwood Portable Blueprinting Machine

To obtain additional information on equipment described on this page, see lower part of page 630.

Holden Heat-treating Furnace Built in Three Sizes

Holden Heat-Treating Furnaces

The A. F. Holden Co., New Haven, Conn., is placing on the market a small gas furnace which it has developed in conjunction with one of the furnace-building companies. This furnace requires no auxiliary air equipment, and can be made in three sizes to take pots 8 by 12, 10 by 14, and 12 by 16 inches. A complete unit with automatic control, including a control valve, nickel thermo-couple, lead wire, etc., can be supplied.

These units are particularly adapted for small shops, for use in casehardening or heat-treating tools. The furnaces can be used for temperatures from 300 degrees F. for tempering steel up to 1650 degrees F. for carburizing, or they can be used for heat-treating baths within this range. 77

Miller-Strobel Electric Arc Saw for Cutting Metal

An electric arc saw designed to cut iron, steel, and any ferrous or non-ferrous alloy, as well as tungsten carbide, has been announced by the Miller Electric Mfg. Co., Appleton, Wis. This machine operates on a low-voltage current applied across the arc, and can be safely employed by anyone, as no special training is required. It is claimed that this saw cuts with equal efficiency, economy, and speed, regardless of the hardness or analysis of the metal. The cut surfaces are clean and smooth. Stacked metal can be cut as easily as a solid piece of metal.

While the illustration shows a cross-cutting operation, the saw can be furnished in special models for slotting, turning, arc threading, arc milling, arc turning, etc. The actual saw unit consists of a soft alloy steel disk provided with a large number of small straight teeth on its outer edge. It is driven through a V-belt at a high speed by an electric motor.

Electric Arc Saw Brought out by the Miller Electric Mfg. Co.

Cuts are made by means of a controlled electric arc that "leaps" ahead of the saw and brings the metal along the kerf lines to a molten or plastic condition. The saw disk does no actual cutting, but serves to sweep the molten metal from between the kerf lines and acts as an electrode from which the heat generating arc "jumps" to the work.

The real function of the saw is to give impulse to an oscillation of the current through a lengthening and shortening of the arc which stabilizes and directs the path of the arc to such an extent that side arcing is eliminated. The arc thus controlled travels in a path a few thousandths of an inch wider than the width of the saw.

When cuts are completed, the saw will be found to be cool. A specially built welding transformer is used to provide a current of suitable voltage and amperage to generate the arc between the saw and the work for melting the metal. The current is controlled to suit the thickness of the metal being cut. This type of saw is made in a range of models to handle various types of production work. 78

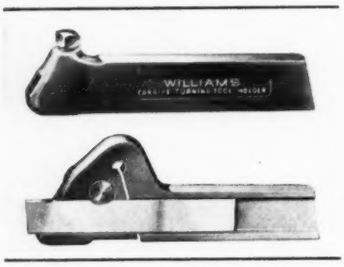
P & H-Hansen 150-Ampere Vertical Welder

The Harnischfeger Corporation, 4400 W. National Ave., Milwaukee, Wis., has added a 150-ampere vertical type welder to its line of P & H-Hansen electric arc welders. This welder is adapted for a wide range of welding in the lighter gage ferrous and non-ferrous metals.

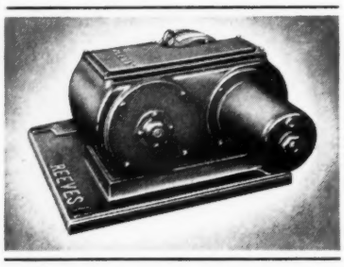
The new welder is equipped with plug-in type receptacles to facilitate current reversing and with a patented single-current control. It is furnished only in the alternating current type of drive. The machine is less than 4 feet in height, and is provided with a towing handle to facilitate movement around the shop. 79

P & H-Hansen 150-ampere Arc Welder

To obtain additional information on equipment described on this page, see lower part of page 630.



Williams Straight-shank and Gooseneck Tool-holders



Reeves "Motodrive" Equipped with Automatic Remote Control

Williams Turning and Cutting-Off Tool Holders

A turning tool holder made in straight-shank and in right- and left-hand offset styles, in five sizes, for tungsten-carbide tools has been added to the line of holders made by J. H. Williams & Co., 61 Spring St., New York City. The cutter is held parallel to the shank of the holder, so that it can be ground to provide maximum support for the cutting edge. These holders are broached to suit either square or flat carbide cutters, but are supplied without the cutters. When equipped with regular high-speed steel bits, the holders are adapted for use on planers or shapers.

Another recent addition to the line of tool-holders made by this company is a spring type cutting-off tool holder, which is available in two types. The gooseneck design of this holder relieves the cutter blade of excessive pressure, thus preventing chatter when used on old or worn lathes. The positive cam cutter lock is so designed that the pressure of the work against the cutter only tends to tighten the grip of the holder on the cutter. This cutting-off holder is supplied in both straight and right-hand offset types, in four sizes. 80

Reeves Automatic Remote Control for "Vari-Speed Motodrive"

A new type of automatic and remote control has been brought out by the Reeves Pulley Co., Columbus, Ind., for use with the Reeves "Vari-Speed Motodrive." This drive consists of a speed control unit, in which a driving motor is combined with a variable-speed mechanism and reduction gears (where required) in a self-contained unit. The unit is built in five sizes, ranging from 1/4 to 10 horsepower, with speed ratios from 2 to 1 up to 6 to 1 in both the horizontal and vertical designs.

The new control, known as "fluid pressure control," is available for all units of the "Motodrive." It can be used to automatically regulate speed by pressure variations, as in the stoker feed of a boiler; maintenance of constant fluid pressure in a pipe line or tank upon which there is a variable demand; maintenance of uniform tension between machine sections or between a machine and a rewinder; and similar requirements for automatic speed control. It can also be used as a manual remote control or as a semi-automatic manual control in various ways.

The complete control consists of a bellows-shifting mechanism mounted on a "Motodrive," as shown in the illustration, an adjustable pressure reducing valve located where desired, auxiliary valves, if needed, and connecting pipes. The operating or controlling pressure is transmitted by means of oil, water, steam, gas, or air by a valve through piping to the bellows-shifting mechanism, which operates to increase or decrease the speed of the "Motodrive," and hence the speed of the driven machine.

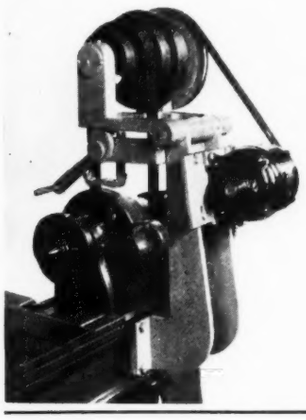
The shifting speed depends on the kind of operating medium used. Air gives the fastest operation. It will shift the control over the widest ratio of 6 to 1 through its complete speed range in two to four seconds. 81

Wells Motor-Drive Unit

A motor-drive unit developed to replace the countershaft arrangements of belt-driven machines has been placed on the market by the Wells Tool Co., 106 Hope St., Greenfield, Mass. This unit was originally designed for use in the manufacturer's own shops, where its application has reduced power cost and improved the operating efficiency of the machines.

The illustration shows one of the units applied to a 14-inch lathe. The unit is made in three sizes to fit lathes having 12- to 20-inch swings. This drive can also be adapted to other machines, such as milling machines, screw machines, and turret lathes. The unit is easily attached to the machine base, only four bolt holes being required for the purpose.

In using the lathe, the control handle on the motor-drive unit can be raised to allow enough slack in the belt for speed changing. This handle is mounted on an eccentric stud which can be adjusted to compensate for any change in the belt length. For tool-room and general shop use, where the lathe must be reversed frequently, a reversing switch



Wells Unit for Converting Belt-driven Machine to Motor Drive

To obtain additional information on equipment described on this page, see lower part of page 630.

should be used, but for most production work this is unnecessary.

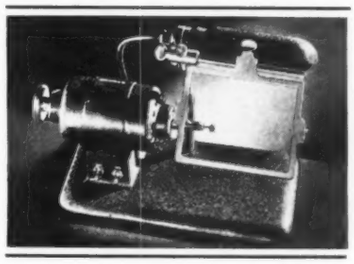
The brake operated by the control handle which permits the lathe spindle to be stopped instantly can be used to advantage when turning large quantities of small pieces that require frequent stopping and starting. Simply raising and lowering the handle at the front of the drive serves to start and stop the spindle without using the motor switch. 82

Lovejoy L-R Flexible Couplings

A flexible coupling adapted for use on the motor drives of oil-burners, refrigerators, household appliances, and other equipment where the load does not exceed 1/4 horsepower has been brought out by the Lovejoy Flexible Coupling Co., 5009 W. Lake St., Chicago, Ill.

This new type of flexible coupling consists of two jaw units and a cushion unit made of a solid tube-shaped section composed of hard rubber, except where it comes in contact with the jaws, at which point it is made of a softer, more resilient rubber. This coupling can be used with short-shaft motors. Fans with hubs built in the form of an L-R flexible coupling jaw that require only two units to complete the coupling are now obtainable. 83

Fan with Hub Built in the Form of a Lovejoy Flexible Coupling



Dumore High-speed Grinder for Small Parts

Small Grinder for Chromium Alloy Parts

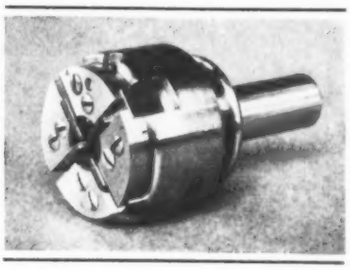
A Model 38 grinder equipped with a 1/5-horsepower universal motor that operates at a speed of 20,000 revolutions per minute has been developed by the Dumore Co., Racine, Wis., for grinding, polishing, and "rubber wheeling" small parts made of chromium alloys and other stainless metals.

The standard chuck of this unit is a 1/32-inch collet type, but a No. 0 Jacobs chuck and a 1/8-inch collet chuck are also available. This machine is equipped with a handwheel to facilitate stopping the spindle for quick wheel changes. The equipment includes a glass eye-shield and a work light. 84

H & G Die-Head for Davenport Automatics

An H & G insert chaser die-head for rotating spindles has been developed by the Eastern Machine Screw Corporation, 23-43 Barclay St., New Haven, Conn., in a new size, the No. 00, Style MM. This die-head is designed primarily for use on Davenport automatic screw machines. It uses the same insert chasers as the No. 00 size, Style DM heads made for use on Brown & Sharpe automatics.

Although the die-head has a capacity for handling work 3/8 inch in diameter, it is only 2 1/8 inches in diameter by 2 5/32 inches in length, excluding the shank, and weighs only 1 1/2 pounds. When used on the Davenport automatic, the die-head is furnished with a hardened shank to fit the threaded spindle of the machine. 85



H & G Die-head for Davenport Automatic Screw Machines

Trebert "Multi Form" Machine for Pattern Shop

A new type of core-box and patternmaking machine known as the "Multi Form" has been developed by Trebert Machines, Canandaigua, N. Y. This machine, in addition to cutting straight, circular, angular, elliptical, spoke, and fan-shaped core-boxes, fillets and moldings, is provided with a screw-cutting attachment for cutting wooden screws or spiral-shaped members of various forms, pitches, and diameters, both straight and tapering, for patterns and for ornamental purposes.

One of the features of the machine is the universal head, which permits angular adjustment of the cutter in either a horizontal or a vertical plane.

Trebert Core-box and Patternmaking Machine

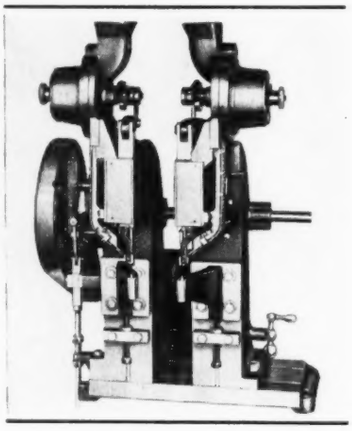
To obtain additional information on equipment described on this page, see lower part of page 630.

The universal head can also be rotated about the axis of the supporting cross-bar bearings to any desired position. The cutter is moved horizontally on either side of the cross-bar by means of a rack and pinion. The vertical movement is obtained by raising or lowering the cross-head. 86

Automatic Multiple Rivet-Setter with Adjustable Centers

An automatic, multiple, bench type riveting unit has been developed by the Chicago Rivet & Machine Co., 1810 S. 54th Ave., Chicago, Ill., to meet the flexibility of application requirements of small-volume production. This machine is designed with double riveting heads and an adjustable centering device. One head remains stationary, while the other head can be adjusted quickly in or out by means of a ball-crank and lead-screw, only a few minutes being required to change from one position to another.

A 1/4-horsepower motor is employed in the drive, and a single clutch operates the plunger, providing uniform rivet insertion and closure, as well as preventing marring of the rivet head or unbalanced tension. Both heads of the machine can be operated simultaneously for setting two rivets at a time or the feed on either head can be locked to permit a single rivet to be set.

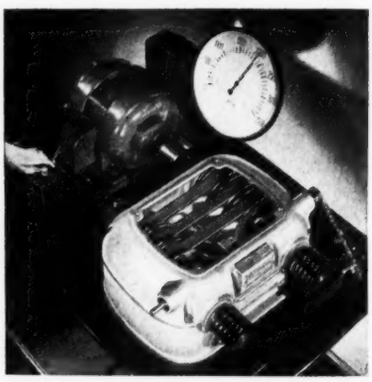


Automatic Rivet-setter Built by Chicago Rivet & Machine Co.

This machine is made in two models, one being designed for light- and the other for heavy-duty work. In operation, the riveter is mounted on a bench and equipped with extension trip-rod and floor trip-treadle. The treadle is so designed that it can be moved to any convenient operating position. The non-repeating type clutch permits safe operation at high speeds. 87

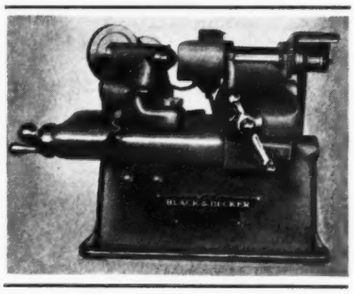
Allis-Chalmers Vari-Speed Changer

A new speed-changer unit that utilizes multi-groove vari-pitch sheaves has just been placed on the market by the Allis-Chalmers Mfg. Co., Milwaukee, Wis. This speed-changer is a ruggedly constructed, compact, totally enclosed unit. It is designed with double-shaft extensions and is driven from a standard motor. The flexibility of the unit makes it adapted for a wide range of lay-outs to suit individual applications.



Allis-Chalmers Vari-speed Changer and Tachometer Demonstration Unit

When the change in speed is to be adjusted manually only, the unit is provided with a hand-wheel control. However, the electric remote control can be provided. Manual remote control is also obtainable. The range of capacities in which the unit is now being made includes ratings up to 33 horsepower, with ratios as high as 3 3/4 to 1. 88



Black & Decker Valve Refacer Equipped for Wet Grinding

Black & Decker Wet Grinding Valve Refacer

A precision wet grinding valve refacer has recently been brought out by the Black & Decker Mfg. Co., Towson, Md. The wet grinding feature of this refacer permits faster grinding without danger of burning the valve face. The wet grinding equipment consists of a combination supply and filtering tank, from which a simple valve-controlled pump forces the solution through "Neoprene" tubing, delivering a steady stream of the coolant on the wheel just above the valve being ground. The solution then flows through tubing from the return trough to the settling compartment of the tank where the dirt settles out before the solution is used again. The tank is made removable to facilitate cleaning. A removable splash guard prevents loss of fluid and protects the operator and machine. 89

Keuffel & Esser New Blueprint Papers

Blueprint papers of a new type have been announced by the Keuffel & Esser Co., Hoboken, N. J. The improved papers, known as "Series 60" have been developed to produce prints of a deep blue color that causes the white lines of the reproduction to stand out in sharp contrast. An unusually wide printing range is claimed for these papers.

Tracings of varying transparency can be printed successfully at a single setting of the machine, or strong blueprints can

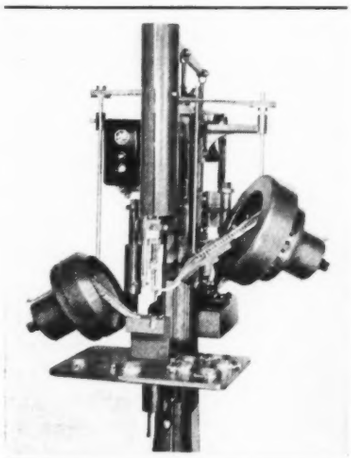
To obtain additional information on equipment described on this page, see lower part of page 630.

be made from any tracing within a broad range of machine printing speeds. This extra margin of printing range reduces the danger of over- and under-exposure, eliminates the necessity for "trial prints," and greatly speeds up production. Unlike ordinary blueprint papers, these are light blue instead of yellow before they are exposed to light. They are printed and washed with the same equipment and in the same manner as conventional papers. 90

Power Screwdriver for Rapid Assembling

A barrel type, magazine-fed screwdriver developed to increase production efficiency and to reduce assembling costs has been placed on the market by the Detroit Power Screwdriver Co., 5365 Rohns Ave., Detroit, Mich. The barrel type hopper makes it possible to handle all types of screws from 3/16 to 1 1/2 inches in length. The hopper is also designed to pick up from the mass and deliver down a track or chute such materials as rivets, spring clips, plain washers, dowel-pins, nuts, etc.; such parts can also be fed to hydraulic or crank type presses. The hopper is also used for feeding square or hexagon nuts. In the assembly of hose clamps or compression clamps, the machine is equipped with two hoppers, one for screws and one for nuts. Screw and nut assemblies are made at the rate of twenty-five to twenty-eight per minute.

The spindle rotates at the rate of 1450 revolutions per minute and has a friction clutch which controls the tension to which the screw is driven. The driving time of screws within the range of the machine is from one to two seconds. 91



Detroit Magazine-fed Power Screwdriver

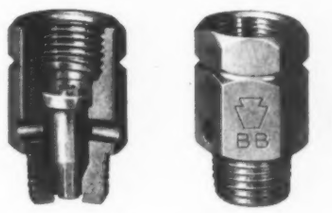
Hanna Speed Control Valve for Air Cylinder

A valve that regulates the admission and exhaust of air to and from each end of an air cylinder in such a manner as to maintain a practically constant piston speed has been brought out by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill. When once set, this valve requires no further adjustment. It is made in 3/8-, 1/2-, 3/4- and 1-inch pipe sizes. 92

Hanna Speed Control Valve

Keystone Fitting for Controlling Bearing Lubrication

A device designed to safeguard anti-friction bearings from being overloaded with lubricant through high-pressure application has been developed by the Keystone Lubricating Co., Philadelphia, Pa. The device is intended for use with the present type grease cup or high-pressure fitting at the bearing.



Keystone Fitting for Controlling Bearing Lubrication

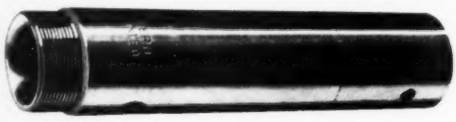
The fitting, a cross-section of which is shown in the illustration, introduces the lubricant to the bearing through a central duct. When the pressure of the bearing reaches 2 1/2 ounces per square inch, back pressure forces the lubricant past a calibrated orifice in the base of the fitting and out through relief ports at the side. This arrangement makes it impossible to overload the bearing so that grease will be forced from the bearing housing into motor windings or other adjacent parts. 93

Ames Dial Scale

A light-weight chromium-plated gage measuring directly in sixty-fourths, thirty-seconds, sixteenths, eighths, and larger fractions of an inch, which can be easily carried in the vest pocket, is a recent product of the B. C. Ames Co., Waltham,

Ames Light-weight Pocket Type Dial Scale

To obtain additional information on equipment described on this page, see lower part of page 630.



Collet Made by Modern Collet & Machine Co.

Putnam "Hi-speed Continuous-pilot" Counterbore

Mass. This gage has a full 1-inch measuring capacity and is adapted for use in selecting drills, reamers, taps, round or flat stock, and odd-shaped parts. It can also be used to check the size of work or parts in process of manufacture and for gaging finished products.

Moving the finger forward and backward against the operating wheel at the top of the gage raises and lowers the spindle and upper anvil and turns the dial. The exact measurement of the part between the anvils appears in the dial slot. 94

Collet Finger Designed to Prevent Scratching Work

The Modern Collet & Machine Co., Ecorse, Mich., has announced a new type, non-scratching collet feed-finger, designated the "No-Mar," which is designed to feed bar stock without scratching its surface. This finger is intended for use only where scratching must be eliminated, the standard pushers made by this company being recommended for the average run of work. The new collet finger is suitable for use on stainless steel and similar materials, or for metal parts that are to be plated following machining, and wherever even slight scratches may be objectionable.

An outstanding feature is the positive forward feed which eliminates any possibility of slipping. Removal of the bar from the pusher-tube can be accomplished quickly and easily by means of a releasing device. 95

Counterbore with Pilot Extending Length of Fluted Portion

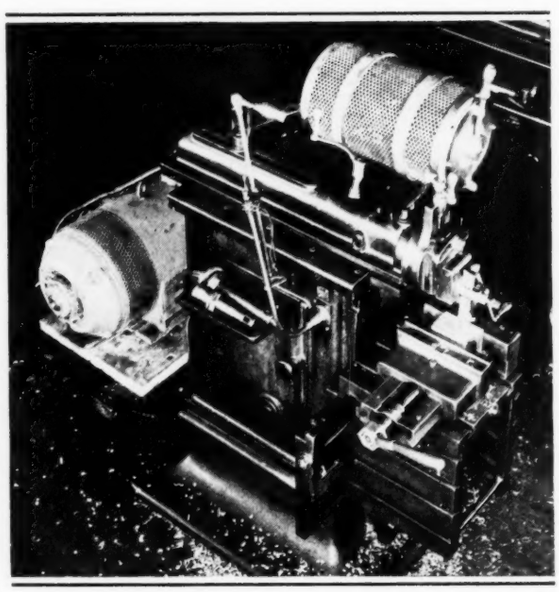
The Putnam Tool Co., 2981 Charlevoix St., Detroit, Mich., has recently introduced a "Hi-speed continuous-pilot" counterbore having a pilot that is continuous throughout the entire fluted portion of the tool. With this arrangement, almost the entire length of the flutes can be utilized before it becomes necessary to discard the tool.

The pilot head is cut off when it becomes too long, as the result of wear on the cutter flutes. The cutter flutes are ground back to the length of a pilot head and a new pilot head is thus exposed. This operation can be repeated as many as six times. 96

Crocker-Wheeler Alternating-Current "Polyspeed" Motors

A three-phase, alternating-current, "Polyspeed" motor designed for efficient and stable speed regulation over a wide range of speeds has been brought out by the Crocker-Wheeler Electric Mfg. Co., Ampere, N. J., in 1-, 2-, 3-, 5-, and 7 1/2-horsepower sizes. Some of the outstanding advantages claimed for this motor are continuous speed regulation without rheostat losses; shunt motor characteristics with the speed practically independent of the load; constant torque throughout the entire speed range; simplicity of construction; across-the-line starting; and remote control, if required.

The speed of the motor can be accurately controlled between the minimum, slightly above standstill, and the maximum of approximately 1800 revolutions per minute by turning the rotor of the speed regulator through an angle of 180 degrees. A large fan, mounted on the motor shaft, supplies sufficient air for cooling the motor under continuous operation at any speed from 1800 revolutions per minute down to 600 revolutions per minute. Owing to



Shaper Equipped with Crocker-Wheeler "Polyspeed" Motor

To obtain additional information on equipment described on this page, see lower part of page 630.

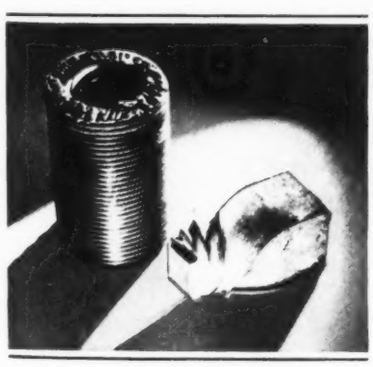
the impaired effectiveness of the cooling fan at the lower speeds, it is not possible to operate the motor at speeds below 600 revolutions per minute, except for short periods of time, without employing some external source of air for cooling. By providing a separate, constant-speed, motor-driven blower, the motor can be operated continuously at any speed down to practically standstill.

One advantage of this motor for machine tool drives is that the speed regulator, being separate from the motor, can be mounted in the position most convenient for the operator. In many cases, the speed regulation can be made automatic. For example, the motor can be used to hold the speed of grinding wheels constant, with a resulting increase in production. 97

Reps Broken Pipe and Stud Extractor

A device for removing broken pieces of pipe or studs from threaded holes has been placed on the market by the Reps Tool Co., Inc., 220 Delaware Ave., Buffalo, N. Y. This heat-treated forged-steel extractor has a Brinell hardness of 490, and is tougher and harder than any of the iron, steel, bronze, brass or special alloy pipes or studs on which it is likely to be used.

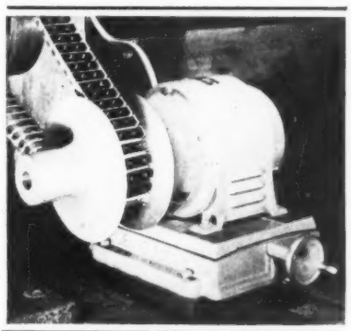
Broken pieces of pipe are removed by inserting the tool into the pipe so that all four points bite at the same time. The extractor is then turned with a wrench to back out the broken part. To remove studs, screws, or bolts, a hole is drilled in the center of the broken part just deep enough for the extractor to get the shallow grip required. The extractor is easily released from the removed part. The surface of the tool is protected against rusting by cadmium plating. 98



Broken Pipe and Stud Extractor Made by the Reps Tool Co., Inc.

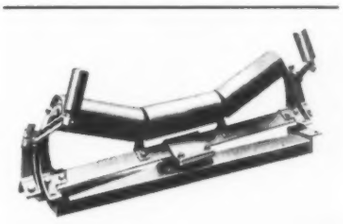
Lewellen Variable-Speed Motor Pulleys

The Lewellen Mfg. Co., Columbus, Ind., has added to its line of variable-speed transmitting equipment a variable-speed motor pulley designed to fit the shaft of a standard motor that is to drive directly to a pulley or sheave on the driven shaft. The motor and pulley are mounted on an adjustable base which permits an infinite number of variations in the speed of the driven shaft.



Variable-speed Pulley Made by the Lewellen Mfg. Co.

Positive equalized disk movements in both directions maintain the belt in the same position for all diameter adjustments. A uniform low spring pressure at all pulley diameters is maintained without causing the belt to buckle. Pressure lubrication is supplied to all bearing surfaces. All working parts, including the spring, are completely enclosed. 99



Jeffrey Self-aligning Belt Idler

Self-Aligning Belt Idler

A self-aligning idler for automatically guiding conveyor belts has been placed on the market by the Jeffrey Mfg. Co., Columbus, Ohio. This anti-friction idler is pivoted on a supporting cross-member, and is provided with guide rolls at each end, as shown in the illustration. The guide rolls are mounted on pivoted arms that extend at right angles to the idler in the direction from which the belt approaches, and can be swung around 180 degrees to permit reversing the direction of belt travel. The guide roll moves outward the instant the belt touches it, and in so doing, causes the idler to swivel sufficiently to return the belt to its normal central position. 100

Hammond "Multi-Hi Speed" Grinder

A "Multi-Hi Speed" grinder recently brought out by Hammond Machinery Builders, Inc., Kalamazoo, Mich., has been de-

Hammond "Multi-Hi Speed" Grinder with Wide Speed Range

To obtain additional information on equipment described on this page, see lower part of page 630.

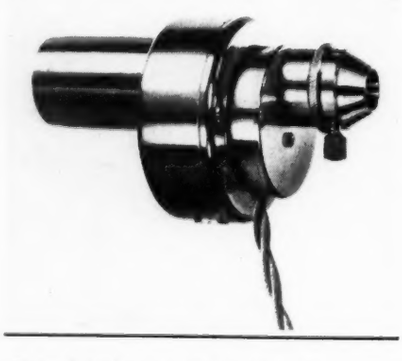
signed to maintain efficient surface grinding speeds regardless of wheel size, so that wheels can be used until worn down to the flanges. The design of the grinder is such as to permit changing speeds quickly and to prevent operating the wheel at too high a speed.

Belts can be replaced without disturbing the main spindle or bearings. The machine will take wheels from 18 to 30 inches in diameter, any any motor from 10 to 25 horsepower. Although designed primarily for high-speed wheels, the grinder can also be used with ordinary wheels. 101

Bristol Pyrometer for Measuring Surface Temperatures

A radiation pyrometer using an Ardometer as a temperature-sensitive unit has been placed on the market by the Bristol Co., Waterbury, Conn. This instrument measures the surface temperature of hot objects above 1000 degrees F. when the Ardometer is sighted so that it picks up the heat rays emitted. The temperature is recorded on a potentiometer on a round or strip type chart recorder, or is indicated on a millivoltmeter pyrometer.

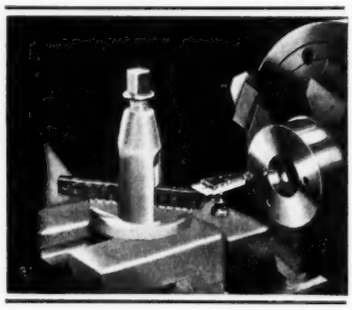
The Ardometer can be sighted directly on the object in the furnace. In this position, it measures instantly the temperature of the object itself and accurately indicates subsequent temperature changes in the material. 102



Bristol Ardometer Radiation Pyrometer

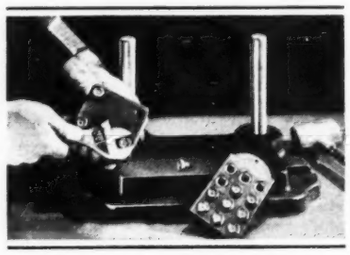
Starrett Universal Indicator

The "Universal Junior" indicator, No. 564, here illustrated, has been added to the line of tools made by the L. S. Starrett Co., Athol, Mass. The unusual versatility of this indicator is due to the flexibility of its construction. The ball contact, for example, is held by friction and can be set to touch the work at any desired angle. The sleeve that holds the contact point can also be rotated through a complete circle, and the entire indicator can be swung around through a full circle when mounted on the shank. These adjustable features make it possible to keep the graduated scale in the most convenient position for easy reading, regardless of the operation or nature of the work.



Starrett "Universal Junior" Indicator

The indicator can be mounted on the side of one end of the shank or on the top of the opposite end when used in the toolpost of a lathe, or it can be removed from the shank and attached to the jaw of a height gage. Readings are made in 0.001 inch over a range of 0.012 inch by means of a needle and graduated scale. The indicator case is 2 1/2 inches long by 1/4 inch thick, and tapers from 11/16 inch at the scale end to 1/8 inch at the contact point. The shank for the indicator is approximately 1/4 by 1/2 by 5 inches. 103



Transfer Screws for Laying out Holes in Mating Part

Nielsen Transfer Screw for Locating Holes

The transfer screw recently introduced by the Nielsen Tool & Die Co., 1861 Gardner Ave., Berkley, Mich., eliminates several time-absorbing procedures in transferring the location of blind holes in the tool-room or shop. These screws are easily inserted in blind holes with an adjustable wrench or a pair of pliers, as shown in the illustration.

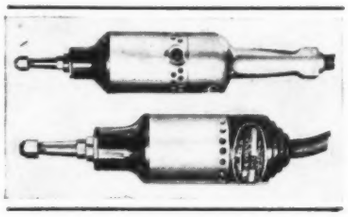
The screws are especially useful in drilling new or repair sections to match the old screw holes. As the heads of the different sizes of transfer screws are of uniform height, different sizes of holes in the same plane can be transferred at the same time. By inserting the screws in the holes to be transferred and striking the section a solid blow, an accurately located center and circle is produced for each hole. The center and drill circle are sunk into the steel from 0.010 to 0.015 inch.

The screws are casehardened, and with ordinary use, will last for years. To take care of shrinkage in the screw holes, the threads of the transfer screws are made 0.005 inch under the standard pitch diameter. 104

Van Dorn Die-Grinders

Two high-speed, light-weight die-grinders designed to give maximum power have been brought out by the Van Dorn Electric Tool Co., Towson, Md. One grinder takes a 2- by 1/2- by 1/2-inch wheel, while the other uses a 2 1/2- by 1/2- by

To obtain additional information on equipment described on this page, see lower part of page 630.



Van Dorn Light-weight Die-Grinders

1/2-inch wheel. These grinders are especially adapted for precision grinding in die shops, metal-working plants, and toolrooms. They are also adapted for grinding composition materials, wood, and stone.

Both grinders are equipped with universal motors which operate on alternating or direct current. The 1/4-inch single-purpose chuck accommodates grinding wheels, pencil stones, rotary files, and burrs. The "no load" speed is 19,000 revolutions per minute, and the full load speed, 12,000 revolutions per minute. The smaller machine weighs 2 1/2 pounds, and the larger machine 4 pounds. ... 105

Manhattan Oilproof Transmission Belt

The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., 44 Townsend St., Passaic, N. J., has brought out a line of transmission belting made from a synthetic material that can be used and compounded the same as rubber, and yet is not affected by the destructive action of mineral oil, as are the rubber friction compounds. This belting, known as "Paranite-G.O.P." (gas and oilproof), is made in regular transmission-belt sizes. There is no natural rubber in these belts, the friction compounds being of recently perfected synthetic material. ... 106

Ransome Revolving Welding Table

A revolving welding table for use in welding tanks and other circular products is being placed on the market by the Welding Division of the Ransome Concrete Machinery Co., Dunellen, N. J. The entire welding device weighs 990 pounds, and consists of a few simple parts arranged as shown in the illustration.

The table is 31 inches in diameter, and 25 inches high when in the horizontal position. There are eight lines of radial slots for work-clamping bolts. The table can be tilted by a hand-operated self-locking worm and wheel to a vertical position either side of the center line, and it will carry a load of 600 pounds with a maximum diameter of 34 inches.

Ransome Motor-driven Welding Table

Work of larger diameter can be carried in the vertical position on one side of the center.

The table is driven by a 1/4-horsepower electric motor through a variable-speed transmission and worm-gear reducer. The range of table speeds of 0.055 to 0.333 revolution per minute corresponds to welding speeds of 0.43 to 2.6 feet per minute on a 30-inch diameter. The speed is adjustable by means of a handwheel on the side of the housing. The table can be reversed, or driven in either direction. ... 107

* * *

Credit Congress of Industry

The National Association of Credit Men will hold its annual Credit Congress of Industry June 5 to 10 at the St. Francis Hotel in San Francisco, Calif. H. E. Kay, credit manager of the Industrial Brownhoist Corporation, Bay City, Mich., is national chairman of the machinery manufacturers group. A program has been prepared listing various topics for discussion that have a vital bearing on the future possibilities of the machinery industry. The purpose of these discussions is to arrive at some definite conclusions as to how industry as a whole can be maintained on a sound basis from a credit standpoint.

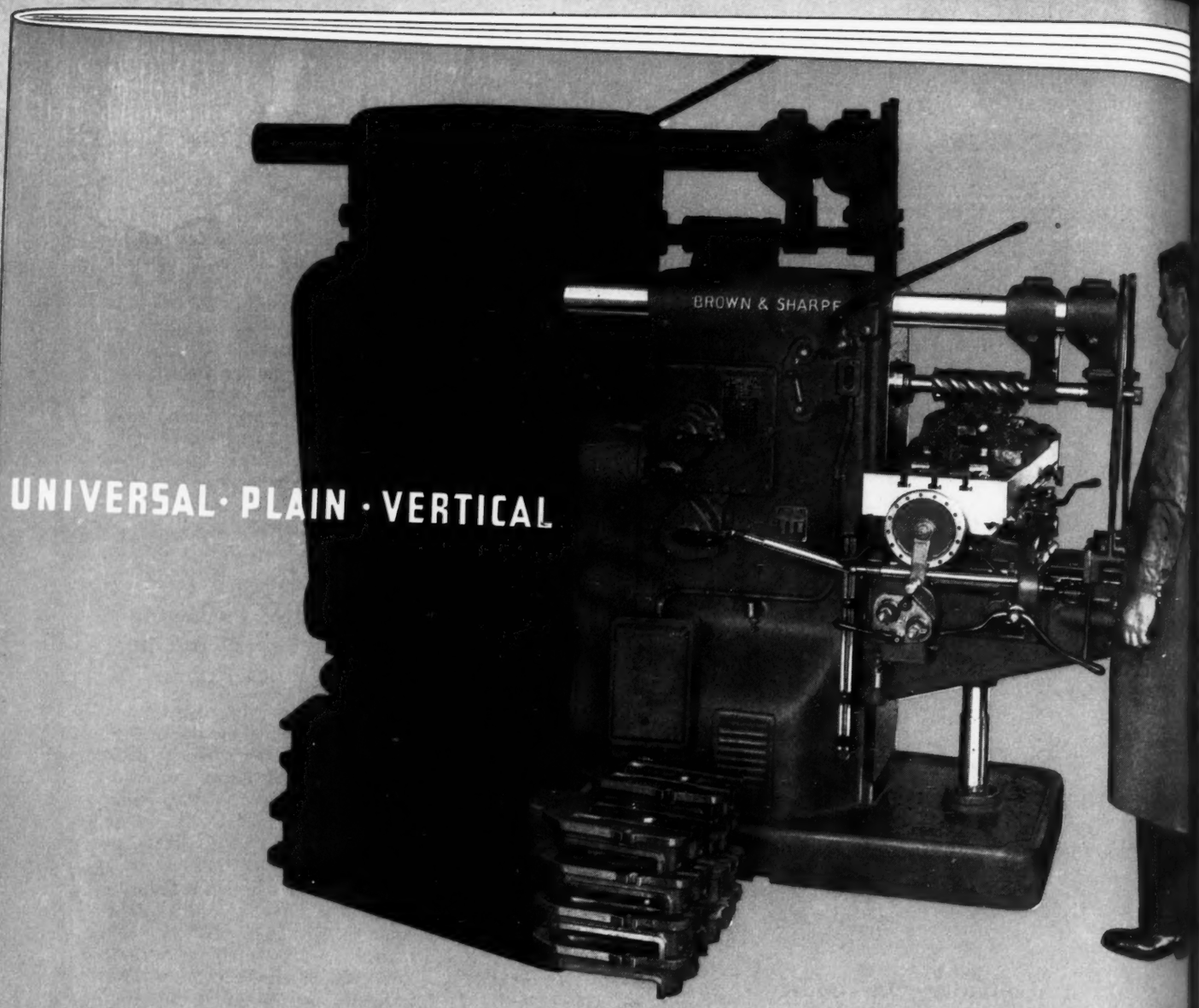
* * *

Method of Packaging Screws Saves Time in the Stock-Room

An identifying labeling system has been adopted by the American Screw Co., Providence, R. I., in packaging Phillips recessed-head screws that saves the time of stock-room clerks. The color of the labels and of the lettering on them enables the various types of screws to be immediately identified. For example, the color of the label identifies the material from which the screws are made, and the color of the lettering on the label indicates the head style. Thus, green labels indicate steel screws, and yellow labels brass screws; black lettering represents flat-head screws, and green lettering fillister-head screws.

Distinctive Package that Indicates Kind of Screws Contained

To obtain additional information on equipment described on this page, see lower part of page 630.



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MILLING MACHINES

Every man responsible for

Profitable Production

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NEW BOOK

--showing the many advantages of these **Modern** *machines for present-day milling requirements.*

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Medal Commemorating Eightieth Birthday of Charles L. Allen

On March 6, Charles L. Allen, chairman of the board of directors of the Norton Co., Worcester, Mass., celebrated his eightieth birthday. In commemoration of this event, the company had a bronze medal struck to honor Mr. Allen, whose name is well known in American industry as that of a man who has contributed greatly to its progress during the last fifty years.

Mr. Allen was first associated in business with F. B. Norton, who in 1873, invented and began the manufacture of the first Norton emery wheel. When the Norton Co. was formed in 1885, Mr. Allen became its general manager and has been one of its executive officers ever since. The development of the abrasive business, including inventions in electric furnace abrasives and the production of grinding machines, carried on by the Norton Co. under his guidance and counsel is recognized as an important contribution to the American machine industry.

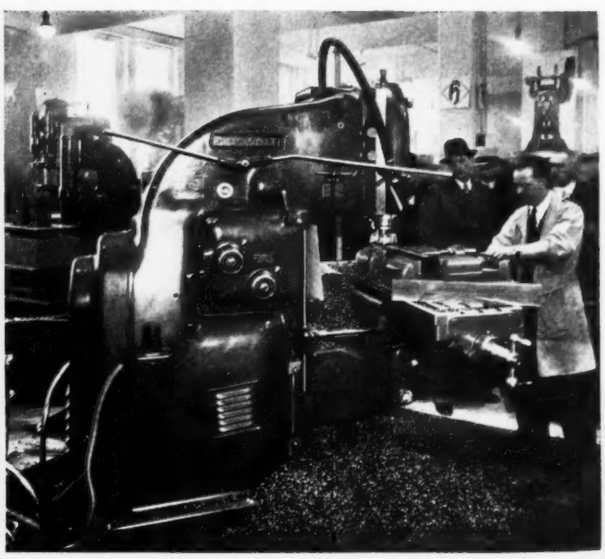
Mr. Allen is still active in the councils of the Norton Co., and as stated by Aldus C. Higgins, president of the company, "is still animated by a spirit of youthful endeavor, still gifted with a vision that looks for better things in the future, still directed by a sterling character standing for high ideals in business and human relations, and still has a warm heart of generous feeling and fine sentiment."

A Medal Struck by the Norton Co., Worcester, Mass., to Commemorate the Eightieth Birthday of Charles Lucius Allen, Chairman of the Board of Directors of the Company

* * *

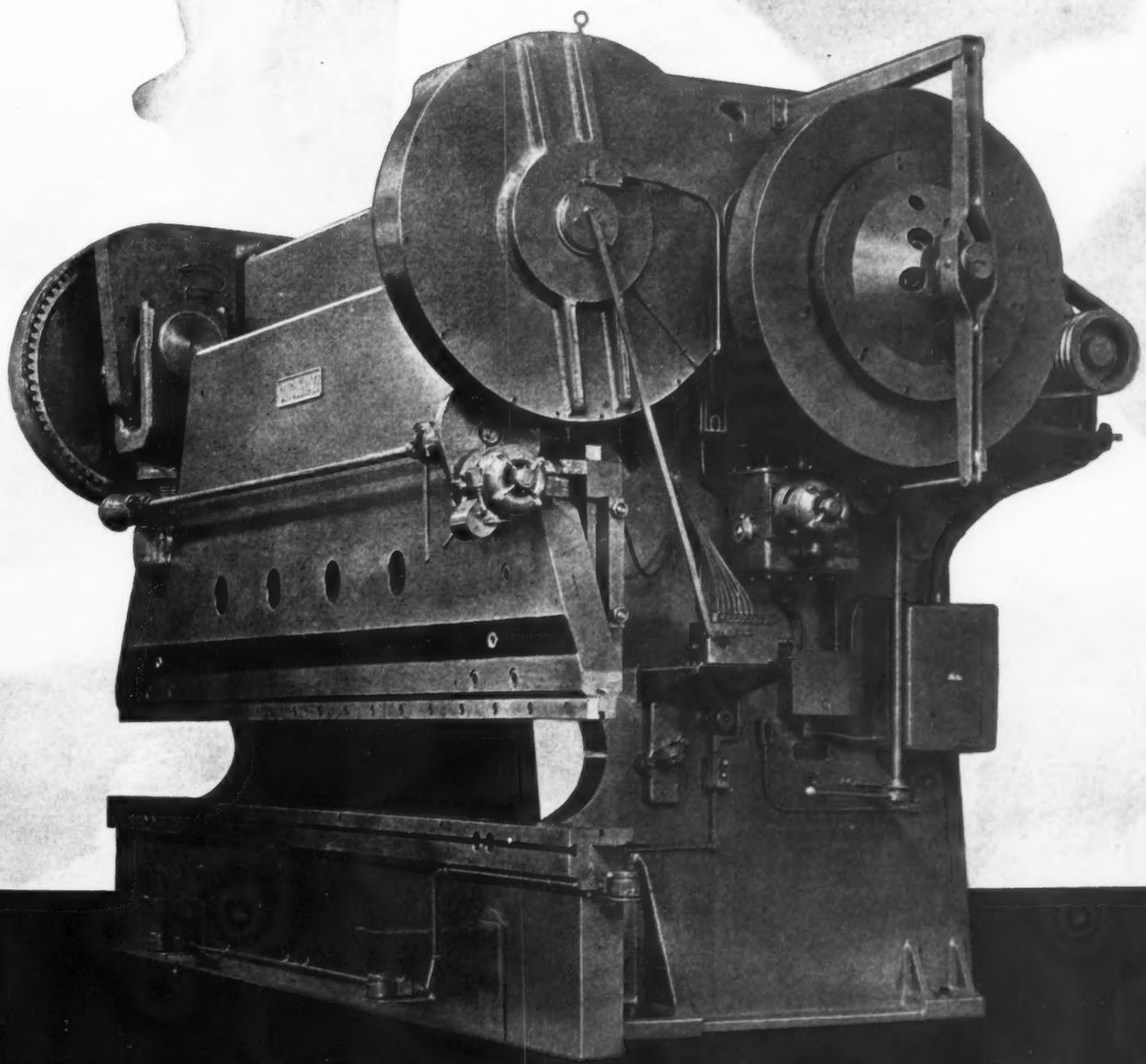
American Foundrymen's Association to Meet in Cleveland

The American Foundrymen's Association will hold its forty-second annual convention in Cleveland, Ohio, May 16 to 19. There will be sessions on gray iron founding; non-ferrous foundry practice; foreman training; patternmaking; cast iron shop practice courses; foundry refractories; job evaluation; steel foundry practice; foundry sand; apprentice training; foundry costs; malleable iron practice; sand research; materials handling; and foundry safety and hygiene.



The Exhibit of the Cincinnati Milling Machine Co. at the Leipzig Fair in March. This Company was the Only American Machine Tool Builder Exhibiting at the Fair. The Exhibits Consisted of a Duplex Hydromatic Milling Machine, a Vertical High-speed Dial Type Milling Machine, a Centerless Grinding Machine, and a Plain Hydraulic Grinding Machine Equipped with an Elliptical Grinding Fixture

Just as Cincinnati All-Steel Shears bring high speed and accuracy to shearing, so Cincinnati All-Steel Press Brakes make new standards in forming sheet metal • • •



THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

NEWS OF THE INDUSTRY

Foreign

LINCOLN ELECTRIC CO., Cleveland, Ohio, announces the establishment of a manufacturing subsidiary to be known as the LINCOLN ELECTRIC CO. (AUSTRALIA) PTY., LTD., at Sydney, Australia. A factory has already been purchased and arc-welding equipment manufacturing operations will begin in a year's time. J. F. LINCOLN, president of the company, who went to Australia to establish the new organization, gave a series of addresses while there before various engineering societies and groups on developments in the art of welding. He states that, in his belief, there is a great industrial future in Australia, due to its unlimited resources and to the pioneer spirit of the people.

HENRI BENEDICTUS, 133 Rue du Progrès, Brussels, Belgium, has made arrangements with ALFRED HERBERT, LTD., of Coventry, England, to represent that company in Belgium. The buildings of the Société Anonyme Belge Alfred Herbert have been purchased by Henri Benedictus, and will be ready for occupancy in a few months. The latter company is now representing several of the best known machine tool builders in the United States.

Illinois and Missouri

BEN W. DIMEND has become connected with the Jackson-Fotsch Co., 400 W. Madison St., Chicago, Ill., representative for Kearney & Trecker Milwaukee milling machines and the products of John Bath & Co., Inc., Eclipse Counterbore Co., Detroit Broach Co., and the Dalrae Tools Co. Mr. Dimend has been associated with the machine tool business for more than twenty years. He was manager of the machinery department of Smith-Booth-Usher Co., Los Angeles, Calif., a direct factory representative for the Warner & Swasey Co. in California, and more recently with the Federal Machinery Sales Co. of Chicago. He will travel through Northern Illinois and the north side of Chicago.

FERRACUTE MACHINE CO., Bridgeton, N. J., manufacturer of forming presses and dies, has appointed the BRYANT MACHINERY & ENGINEERING CO., 400 W. Madison St., Chicago, Ill., exclusive dealer in the Chicago territory for Ferracute inclinable, punch, heavy forming, drawing, and coining presses.

ALLEN-BRADLEY CO., manufacturer of motor control equipment, has moved the St. Louis, Mo., office of the company to 404 N. 17th St.

Michigan

R & M MFG. CO. moved on April 1 into its new plant at 410 E. 5th St., Royal Oak, Mich., which contains 7500 square feet of floor space that will be devoted to the manufacturing of precision gages. The new plant is equipped with a constant-temperature room for lapping and inspecting purposes, the walls and ceilings of which are solid cork. The floor is made of alternate layers of concrete and cork, which not only provides perfect temperature insulation but also absorbs all vibration that might influence the very sensitive and accurate measuring equipment. An air-conditioning system maintains a constant temperature of 68 degrees in this room.

HAMMOND MACHINERY BUILDERS, Kalamazoo, Mich., has appointed ARTHUR E. SMITH, 320 Jackson Bldg., Buffalo, N. Y., representative for the company in western and central New York in the sale of grinders for foundry use. WILLIAM C. EDGAR, Oliver Bldg., Pittsburgh, Pa., will represent the company for the sale of the same machines in western Pennsylvania and northern West Virginia.

EMERSON FRANTZ has been appointed general sales manager of the Bohn Aluminum and Brass Corporation, Detroit, Mich. Mr. Frantz has been with the Bohn organization since its formation. In 1933, he was made manager of the bearing division, in charge of production and engineering, a position that he has held up to his present appointment.

ATLAS TOOL CO., the name recently adopted by the WELCH TOOL & MFG. CO., INC., 11725 Strathmoor Ave., Detroit, Mich., manufacturer of milling cutters, form cutters, and special tools, has been changed to the ATLAS ENGINEERING CO.

New England

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa., is planning the construction of new manufacturing and warehouse facilities at its East Springfield (Mass.) works. The new manufacturing building will have approximately 100,000 square feet of floor space. This increase is being made to meet the growing demands of business in the air-conditioning field and to take care of certain manufacturing operations that will be transferred from the Chicopee Falls, Mass., plant. An expenditure of $1,250,000 is contemplated, a large part of which will be expended for new machinery. It is expected that additional personnel will be required when the new buildings are completed.

NORTON CO., Worcester, Mass., announces that it has made plans for erecting a new four-story building, 60 by 333 feet, to replace Plant 1, which is now fifty-three years old, and the old office building. The new building will have a total floor area of 100,000 square feet. It will be constructed of steel and brick at a cost of $263,000. This is the second step in a replacement program which was started last year.

AUTOMATIC MACHINE CO., 113 E. Washington Ave., Bridgeport, Conn., has been reorganized and will hereafter be known as the AUTOMATIC MACHINERY MFG. CORPORATION. George L. Sexton, president of the old concern, will serve as president and general manager of the new organization. The active personnel of the company will remain the same. The Aetna Industrial Corporation of New York City, industrial engineers, will act in an advisory capacity.

L. HERES DE WYK & CO., Ansonia, COLN., and 844 Little Bldg., Boston, Mass., have been appointed representatives in the states of Connecticut, Massachusetts, and Rhode Island for the D. O. JAMES MFG. CO., Chicago, Ill., manufacturer of speed reducers and gears.

New York

J. F. COOKE, electric hoist sales manager of the American Engineering Co., Philadelphia, Pa., was elected chairman of the Electric Hoist Manufacturers Association at the twenty-first annual meeting held in Cleveland on April 1. Mr. Cooke succeeds Sydney Buckley, of the Shepard Niles Crane & Hoist Corporation. W. W. PEATTIE, president of the Northern Engineering Works, Detroit, Mich., was elected vice-chairman. The headquarters of the Association are at 165 Broadway, New York City.

HIGH SPEED HAMMER CO., INC., Rochester, N. Y., maker of High Speed riveting machinery and precision drilling machines, announces the appointment of the E. L. ESSLEY MACHINERY CO. as exclusive representative of the company in western Michigan, Illinois, Wisconsin, Iowa, and Nebraska.

CHARLES E. WILSON, executive vice-president of the General Electric Co., Schenectady, N. Y., and PHILIP D. REED, assistant to the president, were elected directors at a recent meeting of the board of directors.

Ohio and Indiana

TIMKEN ROLLER BEARING CO. (Steel and Tube Division), Canton, Ohio, has made arrangements with JOSEPH T. RYERSON & SON, INC., to supply Timken mechanical tubing in the territories served by Boston, Jersey City, Philadel-

SAFETY

Every safety measure that might conceivably become desirable is built into the Super-Service Radial. Safety for tools and machine, and Safety features that protect your operator include:

SAFETY ELEVATING NUT—Arm cannot drop even though elevating nut be completely worn out.

SPINDLE SAFETY CATCH—Spindle cannot drop if counterbalance chain should be broken.

POWER RAPID TRAVERSE SAFETY—Protects mechanism against interference at ends of travel and at all points between. Hand wheel does not revolve.

ARM ELEVATING SAFETY—Protects mechanism against interference at limits of travel and at all points between.

FEED SAFETY—Overload by use of wrong feed prevented by patented safety feed gear.

CLAMPING AND ELEVATING INTERLOCK—Prevents engagement of elevating mechanism when arm is clamped, and prevents clamp action while arm is being raised or lowered.

The safety of your investment in the Super-Service Radial is assured by its long life and high productivity. Illustrated Bulletin R-24 explains all these features in detail. May we send you a copy?

THE CINCINNATI BICKFORD TOOL COMPANY

OAKLEY, CINCINNATI, OHIO

phia, Buffalo, Cincinnati, Chicago, St. Louis, Cleveland, Detroit, and Milwaukee. Thus Timken tubing will be added to the Ryerson stocks of certified steels.

J. W. WAGONER, formerly general manager of the Salem Engineering Co., Salem, Ohio, has been appointed vice-president in charge of all operations, both sales and production.

SULLIVAN MACHINERY CO., manufacturer of air and gas compressors, hoists, oil-well pumps, etc., has moved its general offices from 307 N. Michigan Ave., Chicago, Ill., to Michigan City, Ind. The Chicago sales office will remain at the Chicago address.

BLACK & DECKER MFG. CO., Towson, Md., has opened a factory service branch at 935 N. Illinois St., Indianapolis, Ind. H. F. LINDER is service representative at Indianapolis.

Pennsylvania and Maryland

JONES & LAUGHLIN STEEL CORPORATION, Pittsburgh, Pa., announces the opening of a new district sales office in Baltimore, Md., with V. A. JEVON in charge as district sales manager. Announcement is also made of the appointment of R. T. ROWLES, W. H. WIEWEL and H. J. WATT as assistant general managers of sales, the two former having general supervision over the products sales departments, and the latter over eastern district sales offices. JOHN B. DE WOLF and EDWARD H. HUGHES have been appointed district sales managers in Philadelphia and St. Louis, respectively.

AXEL MALM, who until recently was vice-president of the Wetherill Engineering Co., Philadelphia, Pa., is now associated with the Norristown Foundry Co., Conshohocken, Pa. Mr. Malm will be in charge of engineering and sales.

LOUIS H. HEIN CO., manufacturer of industrial lubrication equipment, announces the removal of its business from 2218 Chestnut St., Philadelphia, Pa., to larger quarters at 717 Montgomery Ave., Narberth, Pa.

A. C. DANEKIND, chairman of the factory equipment and practice committee of the General Electric Co., Schenectady, N. Y., was elected a member of the board of directors of the Locke Insulator Corporation, Baltimore, Md.

Southern States

LINK-BELT CO., 307 N. Michigan Ave., Chicago, Ill., announces that the Atlanta, Ga., plant of the company, located at 1116 Murphy Ave., S.W., has recently been substantially enlarged in order to provide for a larger engineering department, more shipping space, and additional area for stocks of elevating, conveying, and power transmitting machinery equipment. The addition consists of an extension, 20 by 288 feet, to the north side of the building, constructed of structural steel framing with steel sash and corrugated metal covering.

HARNISCHFEGER CORPORATION, Milwaukee, Wis., has appointed two new distributors in the state of North Carolina. The CONSTRUCTORS SUPPLY CO., INC., Durham, N. C., has been appointed exclusive excavator agent for the state and will also represent the P & H line of welders and hoists on a non-exclusive basis. The NORTH CAROLINA EQUIPMENT CO., Raleigh, N. C., will also handle the sale of P & H hoists and welders.

Washington, D. C.

W. H. RASTALL, for many years connected with the machinery industry in various capacities, including nine years as sales representative of numerous American firms in the Far East and twelve years as chief of the Industrial Machinery Division of the Bureau of Foreign and Domestic Commerce, has joined the Tariff Commission as the Commission's machinery specialist.

Wisconsin and Minnesota

H. S. STROUSE has been appointed vice-president of the Harnischfeger Corporation, Milwaukee, Wis., manufacturer of traveling cranes, excavators, etc. In addition to the duties of his new position, he will continue to direct the activities of the treasurer's department, which he has headed for the last seven years. Mr. Strouse has had experience in all the departments of the corporation—engineering, advertising, and financial.

H. S. Strouse, Newly Appointed Vice-president of Harnischfeger Corporation

GISHOLT MACHINE CO., Madison, Wis., announces the following changes in its direct sales representation: The company's eastern office at 1060 Broad St., Newark, N. J., under the charge of R. D. HEFFLIN and R. H. BRUCE, will handle eastern New York, eastern Pennsylvania and the states of New Jersey, Delaware, and Maryland. GLENN M. ROGERS, 7 Maple St., Pittsford, N. Y., will have charge of the western New York district, including the Syracuse, Rochester, and Buffalo areas. D. A. WALTERS, formerly of the Ohio territory, has been transferred to the Detroit office at 4-270 General Motors Bldg. The state of Indiana, south of an including Muncie, will be covered by the Dayton office, 1506 Mutual Home Bldg., Dayton, Ohio, of which E. B. VERNER is in charge. HAROLD EARL, formerly of the Gisholt service staff, has been transferred to the Chicago area sales office at 2400 W. Madison St., and will cover western Illinois, the state of Iowa, and the St. Louis district.

DAYTON ROGERS MFG. CO., Minneapolis, Minn., has recently appointed the following representatives for its improved universal pneumatic die cushions: F. R. FOW, 30 Church St., New York City; R. A. VINE, 654 W. Willis Ave., Detroit, Mich.; H. J. WEBER, 440 Repton Road, Riverside, Ill.; and the MEYER MACHINERY CORPORATION, 1939 Santa Fé Ave., Los Angeles, Calif.

OBITUARIES

JOHN C. CAMPBELL, president of the Newark Wire Cloth Co., Newark, N. J., died March 18 at his home in Newark after a short illness, at the age of seventy-eight. He had been connected with the wire cloth industry, in which he was a leading figure, for more than sixty years. Mr. Campbell started working at the age of seventeen in the Stephens Mills, later known as the De Witt Wire Cloth Co. He developed many special processes for the weaving of wire cloth and greatly aided in raising the standard of this product to a high level. He perfected a spiral-weave filter cloth which is now in use throughout the world.

JOSEPH WOODLEY GOSLING, decorative designer for the Illuminating Engineering Laboratory of the General Electric Co., died on April 4 in Schenectady, N. Y., following an operation. Mr. Gosling had been connected with the General Electric Co. since 1912 and was responsible for the artistic and spectacular illumination of practically every World's Fair since the Panama-Pacific Exposition.